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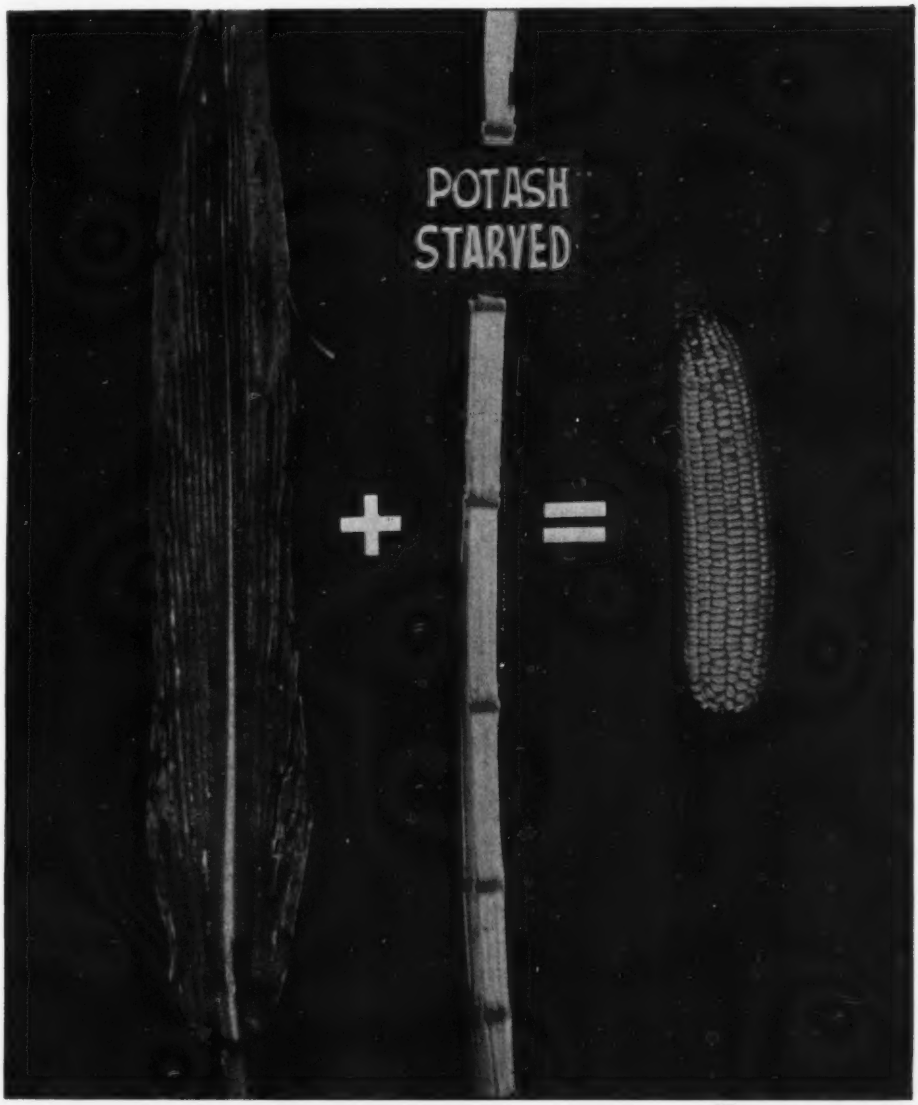

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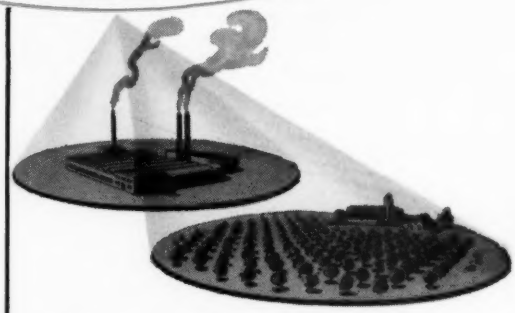

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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: 1102 16th Street, N. W., Washington 6, D. C.

VOLUME XXXVII NO. 3

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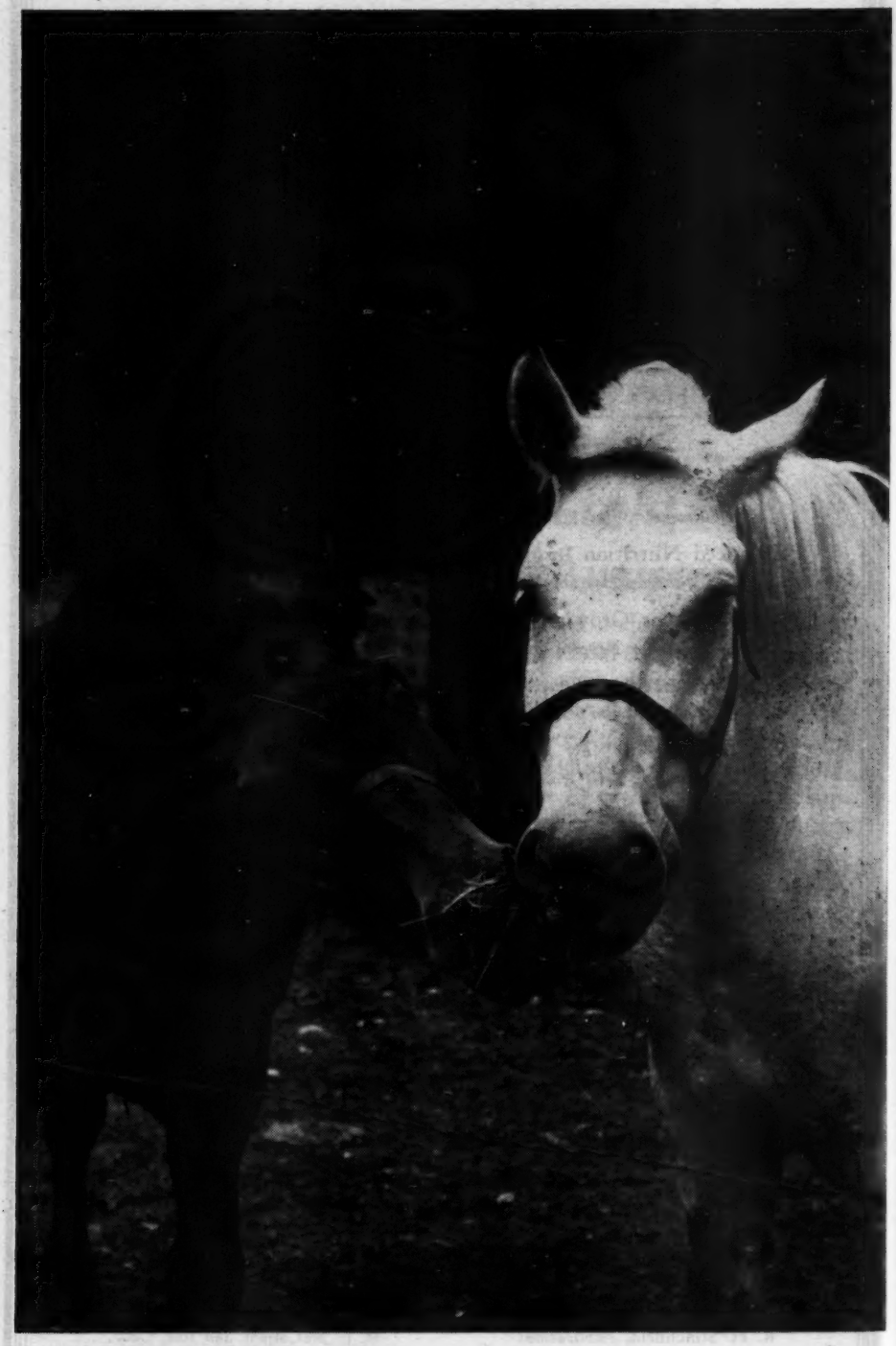

Sharing the First Mouthful of Green from over the Fence

Better Crops with PLANT FOOD

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VOL. XXXVII WASHINGTON, D. C., MARCH 1953 No. 3

A breakdown of . . .

Waiting

Jeff McDermid

WISEACRES say that people spend from 20 to 50 per cent of their lives sleeping, and from 10 to 20 per cent of their time eating and drinking—yet nobody much has ever bobbed up with a theory as to how much of the waking hours in our careers we spend in simply waiting.

Waiting may be pleasant and anticipatory of good things ahead or dreary and unproductive. It may be caused by our own bad planning or someone else's heedless or accidental fault. In any event, it's a pause and a deferment, a halt and a slowdown—a period of temporary inaction which is dead against the grain of most rugged, go-getting Americans.

Only youngsters with time on their hands to squander and oldsters who like to relax and conserve their energies look upon waiting without great dismay. The joke about it is that the only ones who are really professional waiters are actually not the ones who do the waiting, as hosts of disgruntled diners know, from soup to nuts.

Thus far we have had no schools of etiquette or mental equilibrium dedicated to alleviating or adjusting the feelings of ordinary harassed mortals caught in frequent waiting spells. It seems that here exists a glaring void in our current physiological and psychological practice that might well be cultivated as a boon to bystanders and a solace to those who get "stood up."

To be able to endure a long wait with patience and less reliance upon chain-smoking and crossword puzzles

might help us to pass the lost time with greater fortitude and resignation. Countless husbands would pay glowing tribute to the daring author who landed a piece of outspoken warning in some feminine magazine, or gave the gals the works about making menfolks wait through a modern T-V sermonette, along with the soft, dishwashing hands and the kissable breath tablets.

YET in the course of human events some of our fondest and clearest recollections have something more or less to do with waiting around for happenings. I presume this is because as one stands or sits in relative idleness in the vacuum that precedes some potent incident, the mind registers on memory's sensitive plate in a stronger way than when we get what we want in a hurry. If events come too fast or life gets too complex, complicated, and crowded, the result leaves a gray haze in our memories that rubs out easily. So we may now test our theory that waiting leaves its mark as an indelible reminder from impressionable childhood to that elderly era when waiting is just about all one is sure of this side of paradise.

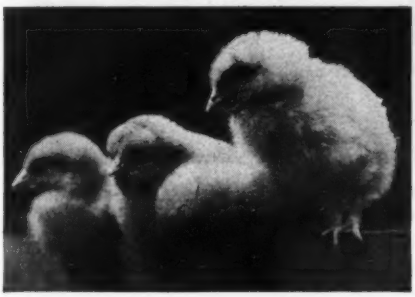
Back yonder in boyhood there came a time when Mother was absent from home, tending some sick relation or away on a vacation. Dad was on deck part of the time, but the place was lonely when you got back from school. The meals were frightful concoctions, and the sense of serenity and normalcy was gone. You'd sit in the twilight and imagine what Mother was doing and get panicky about all the things that could happen to delay her return. Then on the bright day of her homecoming you picked some zinnias and marigolds and put them in Grandma's choice vase, gave the dirt another flick under the rug, washed the grime from behind your ears, straightened the tidy on her favorite rocking chair, washed up the sinkful of dishes, and waited joyfully for Dad to drive in with his precious partner. That spell of waiting taught you heaps of sound things about realities, so that when the class sang "Home, Sweet Home" you could really lift your changing voice in fervent praise.

If your Mother's family register showed that your birthday was late in August, you kept that date in mind daily through July and let the homefolks know in a roundabout way that there were certain choice and useful things you wanted most. To be worthy of consideration, you observed the amenities carefully, obeyed parental admonitions, hewed close to the line, tried not to shirk your chores, spent reasonable hours at the swimming hole and the pasture ball diamond, and did all the dutiful errands and favors that Boy Scouts of a later era uphold. When the day was almost upon you, somebody remarked that you were getting older and were almost a man. Instead of annoying or scaring you—as mention of birthdays often do now—this natal day was like the first quarter-mile stretch on a two-mile heat—just a warming-up spell to loosen your life's legs and point your nose to the long course your feet must travel. Such a waiting spell taught you kinship with all the world of living things and made you thankful for a sheltered haven in which to train for the tricks and turns of the race to come.

YOUR grade school was really a great spot after all, when you think it over now. But in those callow days of youthful rebellion at rigid deportment, you put red rings around the pleasant date of June 15. This culmination of long weeks of yearning opened for you a glorious vista. No more nine o'clock regimentation and weary hours of recitation and cramming. The big outdoors beckoned, the days were long again, the humidity and heat of summer were upon your shoulders, and the gleaming, leaping fish along the river and the string-ball in the closet hoard tantalized your dragging school hours. But somehow, looking behind you now, you wonder why this spell of waiting was so irksome, as you realize

in the fullness of time that the school of life has harsher and crankier teachers than the worst of those you sought to leave behind.

In the whole realm of waiting spells, nothing ever compares in juvenile glee with the arrival of the circus in your old home town, with your bunch of chums gathered at the best vantage point to see the parade—at the corner of Maine and Doty streets. The bills had been plastered up on fences and sheds for six weeks previous, admired



and marveled at by every kid and dog in town. Finally the day broke warm and clear, you hustled down to meet your friends, some already high on the extending limbs of sycamores, and others perched on lamp posts or peering from second-story office windows. The popcorn and spun candy hucksters and the circus vendors with balloons were on hand an hour before the pageant, adding much to your anticipation. At last after all hope was almost gone, the faint blare of the trumpets and the thud of heavy drums pushed you frantically to the sidewalk edge. Down there at the bridge were white horses with waving plumes, golden chariots, fancy riders and tumbling clowns, the piping calliope, and the growling lions in closed cages—a year's dream come true for a hopeful kid in a country town. Yes, we agree from a distant point of time, this event and the wonders of the Glorious Fourth were so much worth waiting for that many of us would gladly go back there and wait for twice as long if we might capture all the rapture it entailed.

BACK to school again. This time you are waiting in fear and nervous exhaustion for your turn to mount the platform in the monthly "rhetoricals." Few boys who later become senators and auctioneers, perhaps, ever show much sign of liking oratory in the schoolroom. With the rest of us retiring chaps, the gruelling indoor exercise ordered by the top professor was excruciating punishment. You usually chose the piece to be given from the library collection of noble fulminations or literary gems. You borrowed the book for home study a couple of weeks ahead of the afternoon when it was your turn to be a martyr to culture. Pledging your closest chums to decorum and decency, lest they snicker and make faces, your hour of dread approached and your throat got dry. The rest of it is buried in the fog of forgotten tortures. Somehow you stumbled to the rostrum, gazed fixedly at some spot across the room, and mumbled through the ordeal minus the proper gestures called for in rehearsals. It was years later before you learned that this awful waiting spell helped condition you for doing many tasks the human mind shuns and dislikes.

By the time a few years afterward when you were elected to make the "junior response" at graduation, or even later as "class orator" on commencement day, the interval of waiting on the high platform edged with potted palms and paper flowers found you steeled and ready, willing and eager to do your best. The nervousness and timidity were gone because Pa and Ma were down there waiting too, and a thankful kid simply couldn't let them down. Here the sense that others who had faith in you and were also waiting gave you the courage to overcome yourself.

Next on memory's list of anxious waitings is the evening before your first paying job. Although you knew the head of the shop where your first assignment in life's duties lay, there was a

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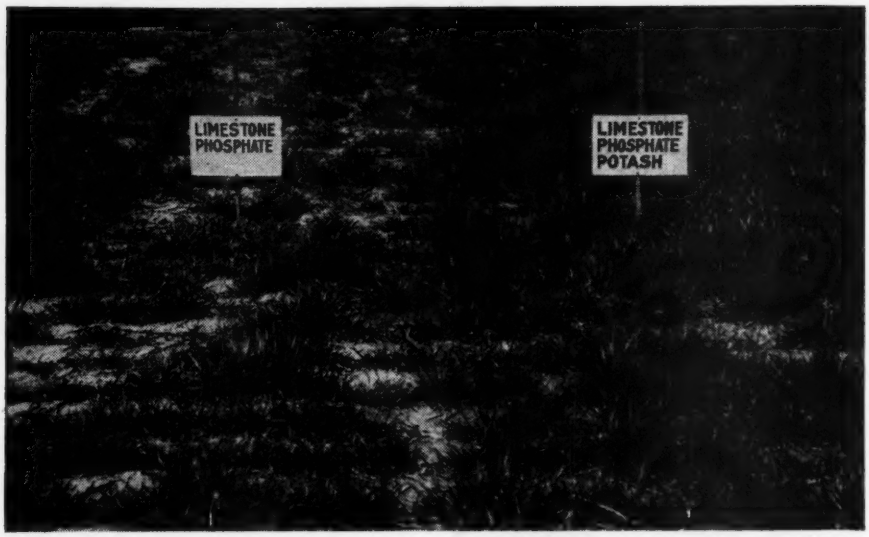

Fig. 1. Potash increased topgrowth of wheat and improved uniformity of stand. Oblong Soil Expt. Field, Oblong, Ill., April 10, 1952.

Balanced Nutrition Improves Winter Wheat Root Survival

By P. E. Johnson[1]

Agronomy Department, University of Illinois, Newton, Illinois

WINTER-KILLING of wheat roots seems to be a vital factor in limiting wheat yields, according to 1952 wheat root studies in southern Illinois experiments. Total yields and quality are dependent upon a fertility balance which will keep wheat roots alive during the winter and early spring months.

Wheat often comes through certain winters in ragged condition with uneven stands. This was particularly true in the spring of 1952 on the clay pan soils of southern Illinois. (See Fig. 1.) Farmers asked—"What is wrong with wheat?" Surface examinations about April 1 indicated these stunted wheat plants had few active roots attached.

There was more than one cause of poor early spring growth, as indicated by conditions of wheat on variously treated plots at several long-time soil experiment fields operated by the Department of Agronomy, University of Illinois, in this soil area. Deficiencies of either limestone, phosphates, or potash resulted in stunted wheat plants. But what about those root conditions below? The possibilities from under-

[1] The author wishes to express his appreciation to H. L. Garrard of the American Potash Institute for photographs used herein and for assistance during these wheat root studies.

ground studies were fascinating.

It is difficult to get proper root samples intact without injuring other portions of small experimental plots. To start a root study project, a number of metal frames were made, 12 inches long, 8 inches wide, and 9 inches deep. A frame was forced into the soil, and the block of wheat roots and soil removed intact, representing one foot of row. (See Fig. 2.) These in turn were placed upon a wire screen and the soil was washed from the roots by a light spray of water.

The same story came from studying wheat roots dug at each of three experiment fields. Wheat roots were subject to winter-killing where the fertility was severely out of balance. When either limestone, phosphate, or potash was deficient, the roots were stunted and sometimes dead. But comparable wheat roots dug in early April from adjacent plots with combined treatments of limestone, phosphate, and potash had large masses of roots, which were lighter in color, with more roots extending below the 9-inch level. Comparisons of wheat roots are shown in Figs. 3, 4, and 5.

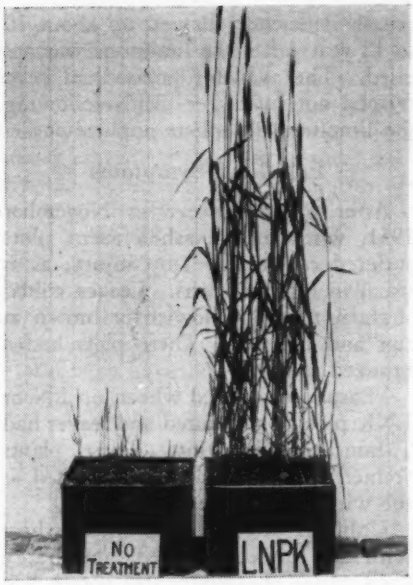

Fig. 2. Samples of wheat with soil blocks in metal frames before washing roots. Same wheat as in Fig. 5. Brownstown Soil Expt. Field, May 29, 1952.

Illinois Soil Experiment Fields

Root studies were made at Brownstown, Toledo, and Oblong Soil Experiment Fields, where soil conditions are more or less representative of many counties in the southern third of Illinois.

The unimproved gray silt loam soils over tight clay subsoils might be called multiple deficiency soils, that is, with several limiting factors, both chemical and physical:

1. The impervious subsoils on unimproved fields often cause excessive water to accumulate in the root zone during winter and early spring. Drainage, aeration, and moisture-holding capacities of such soils can be improved by liming and growing deep-rooted legumes.
2. These soils require 3 to 5 tons of limestone to insure good alfalfa and clover growth.
3. They are low in native organic matter, with nitrogen release slow, and often inadequate for corn and wheat.
4. Available phosphorus is low, especially for wheat and legumes.
5. Available potassium is low, and usually inadequate for legume hays, corn, soybeans, and wheat.

The Oblong and Toledo Fields were started in 1912 and have been operated for 40 years over 10 rotations, with various combinations of treatments including limestone(L), phosphates(P), potash(K), manures(M), crop residues(R), and supplementary nitrogen (N). The Brownstown Field was started in 1940 and has completed only three rotations. The same trends of fertility balance have been noted at all fields. Soon after the treatments were started, the greatest relative response was from limestone, especially on the stand and growth of legumes. Wheat responded well to phosphates. Severe

potash deficiency showed up about 10 to 12 years after the limestone was applied. The available potash had been farmed out by larger yields following the limestone-phosphate applications.

Fall Leaf Symptoms

After a hard freeze in November 1951, wheat on potash-deficient plots suffered considerable top injury, as is usual in many seasons. Leaves wilted slightly, turned yellowish or brown at tips and margins. These plots had a bronzed look.

Phosphorus-starved wheat, on LN or LNK plots, was stunted and leaves had a faint purplish tint. These plants seemed comparatively more stunted as the winter progressed.

Unlimed plots grew stunted wheat with an undernourished appearance even where phosphates and potash had been added. The appearance of wheat on unlimed plots seemed progressively worse as the winter advanced.

Spring Conditions

Heavy snows and cold weather prevailed in December. The weather warmed up in January and wheat seemed to revive. By February 1 it was apparent that something was severely wrong with wheat on certain plots, as many plants seemed nearly dead. Plants appeared darker green and more healthy on lime-phosphate-potash plots; however, there was also slight evidence of winter-killing on these plots.

Root Injuries Vary

Wheat roots dug on April 8 from Oblong and Toledo Fields showed wide variation in total root growth, depth of active roots, and color. (See Fig. 3.) Roots from the RLPK plots were generally strong and healthy, while those from the no-phosphate(RLK) and no-potash(RLP) plots were less numerous, and many seemed to have been winter-killed. Surviving roots on the no-phosphate plots (RLK) were slightly darker in color than those from the no-potash plots (RLP). Many wheat plants which had lost their original root systems re-established themselves by growing new spring roots, which were about 3 inches long by April 8.

We cannot say just why a nutrient deficiency might result in winter dam-

Fig. 3. Roots and topgrowth from one foot of row. Left, no phosphate; center, complete treatment; right, no potash. Oblong Soil Expt. Field, Oblong, Ill., April 10, 1952.

age to roots. Roots supply water and minerals to leaves, but leaves also must supply carbohydrates to roots for new growth and energy. Therefore, a breakdown of any one of the reciprocal functions of roots or leaves automatically slows down the growth of that plant.

Further Root Studies

Further root excavations were made at the Brownstown Soil Experiment Field on April 22 (see Fig. 4), and on May 29 (see Fig. 5). In late April, differences due to deficiencies of either limestone, phosphorus, or potassium were very outstanding, as shown in Figure 4. Roots without limestone or without phosphates were somewhat darker than those without potash. All were stunted in growth. The LNPK plot had more roots extending below the 9-inch depth but they were broken off. Up to this stage, no marked benefits from nitrogen were evident.

There was less increase in volume of roots from April 22 to May 29 than might have been expected. The same relative differences of volume and color between treatments seemed to prevail. (Compare Figs. 4 and 5.) Note top-growth differences on May 29. By this time the effects of topdressed nitrogen also were apparent. (Compare LNPK vs. L-PK.)

Winter Injury from Unknown Causes

Supposedly adequate soil treatments did not prevent all winter injury to wheat roots. As high as 20 per cent of individual plants on certain fertility plots which received minerals and extra nitrogen were injured to some extent. One area at the Newton Field which had been in continuous wheat for 10 years had an estimated 75 per cent of plants with some winter injury in spite of supposedly adequate nutrients. Many of these plants seemed to recover more quickly in the spring due to the nutrients available.

Further studies are now in progress on factors other than chemical nutrients, and which may be involved in root injuries. The key to higher wheat yields may come from further root studies regarding nutrient balance, soil physical conditions, genetic improvements, or disease resistance.

We must admit that average top yields attained recently are too low, both on experimental plots and on farmers' fields in this area where minerals and nitrogen in amounts believed to be sufficient have been added.

Root Injury and Yield

Tillering, yield, and quality are all related to root growth and survival. Wheat plants with large masses of roots surviving the winter had a tendency to grow more tillers. Plants with stronger roots grew vigorously from the time they emerged from dormancy until ripening, thus producing higher yields of quality wheat.

Plants which lost part of their root system from winter injury were forced to grow new roots in the spring. Such plants grew few tillers strong enough to mature good heads of wheat. The grain was generally of poor quality.

Lodging Reduced

Wheat may lodge from causes other than potash deficiency; however, low-potash plots on experimental fields invariably produce weak-strawed wheat which has a tendency to lodge.

Balance Means Profit

The absolute necessity for balanced nutrition is illustrated by average wheat yields from certain key plots at the Brownstown Field, as shown in Table I and Fig. 6. There are 54 different single treatments or combinations in the experiment. A maximum gain of about 30 bushels came from the combined treatment (LNPK). There were losses of about 10 bushels from deficiencies of either nitrogen or potassium; and losses of about 20 bushels

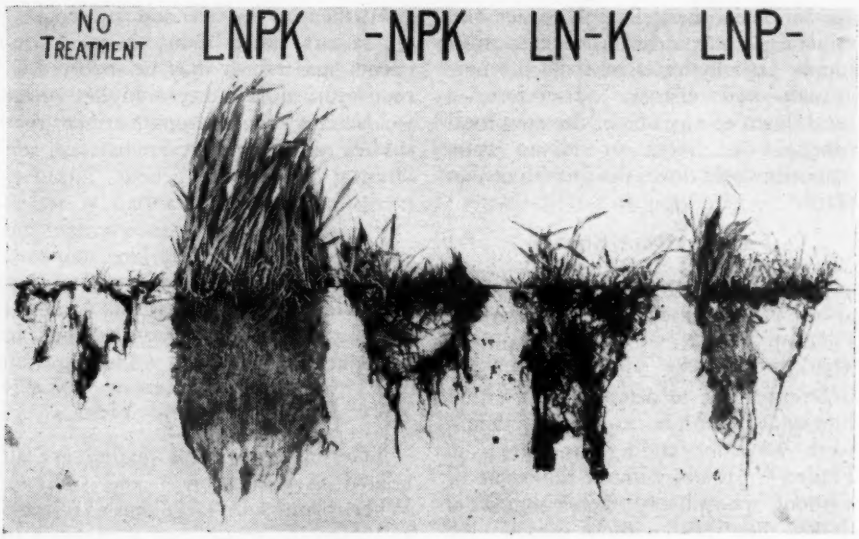

Fig. 4. Any one nutrient deficiency affects early spring growth and root conditions. Brownstown Soil Expt. Field, Brownstown, Ill., April 22, 1952.

per acre if either limestone or phosphorus was not applied. Here is proof of the old saying—"A chain is no stronger than its weakest link."

There are many interactions or reciprocal benefits between treatments which are illustrated by these data.

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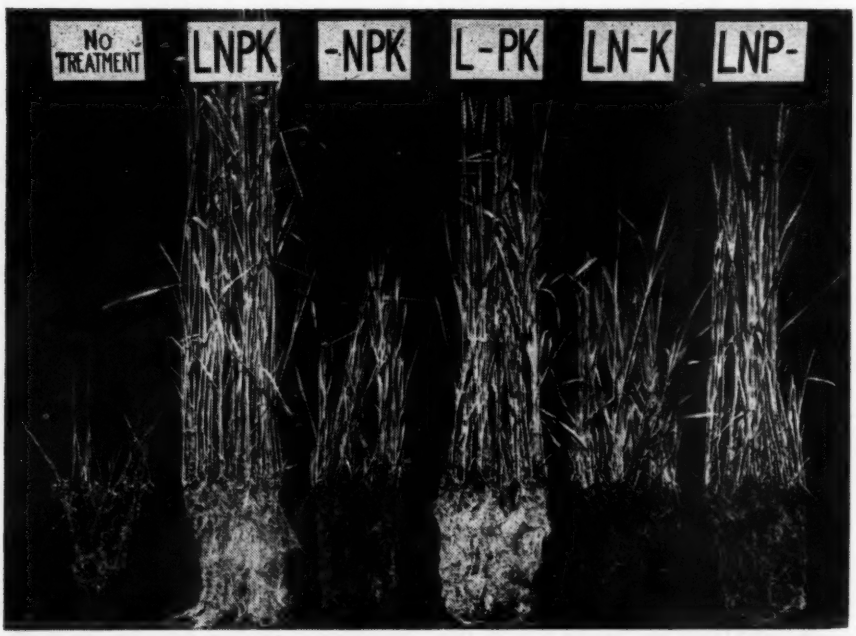

Fig. 5. At heading time both root conditions and topgrowth vary according to soil treatments. See Table I for yields. Brownstown Soil Expt. Field, Brownstown, Ill., May 29, 1952.

Fig. 1. This 9-acre field of 7-year-old kudzu provided 42 cows with 51 days of grazing during late August, September, and early October 1952. H. T. Woodfin farm, Spartanburg County, S. C. Soil Conservation Service photo.

Kudzu Keeps Growing During Droughts

By T. C. Mauer

Regional Agronomist, Soil Conservation Service, Spartanburg, South Carolina

A LARGE proportion of the 428,328 acres of kudzu planted on farms cooperating with soil conservation districts in the Southeastern Region was used for grazing or hay in 1952. A lot of it had never been needed badly enough, for feed, before this past dry summer to make it advisable to fence for grazing or to tackle the job of mowing it for hay. But there is very little kudzu now that has not been used.

Kudzu is good cattle feed. You can hear its praises being sung in every state of the Southeast. A lot of farmers are bemoaning the fact that they did not have some kudzu last year. They can see a field or two on their farms that would be very profitable if they only had the land in kudzu.

There are more than 500,000 additional acres planned for kudzu on farms cooperating with the soil conservation districts in the Southeast. A lot of farmers who have kudzu already

planted are going to increase their acreage. There is a large acreage in the Southeast that should be in kudzu.

Most of the acres that have been planted or planned are in land capability Classes III, IV, VI, or VII. In fact, most of the kudzu has been planted on land that was not considered fit for anything else. It had been cropped at one time but it washed away, gullied, or eroded down to the unproductive subsoil. It is this kind of land that produced a crop of kudzu for hay or grazing when it was sorely needed. Many of the reports coming in recently have mentioned that this was the first year the kudzu had ever been used. Now that it has been used and found to be so good it is going to need fertilizer and grazing management. Nearly all who are using kudzu for the first time intend to fertilize this spring.

Lewis Williams, Montezuma, Ga., has 20 acres planted in 1942. This 20-acre field is made up of land capability Classes II, III, and VI. It was not very productive land at the time it was planted to kudzu. The kudzu was burned off this past spring to get rid of the heavy vines. The cows—23 head—were put on the kudzu field May 1 and were still on it in middle October. Mr. Williams says this is the first time the kudzu has been used. He says now he is going to apply 400 pounds of 0-14-10 and sow crimson clover on the field this fall.

Management Is Important

There are a good many farmers who could tell Mr. Williams not to expect May grazing from the over-seeded kudzu. The clover has a tendency to hold back the kudzu in the spring. The clover is established and making its most vigorous growth just when the kudzu would like to start growing. Management comes into the picture when you have two crops like this on the same land. If you want to favor the kudzu it will be best to graze the crimson clover down early in the spring so as to keep it from making a rank growth. The new growth of the kudzu is more palatable than the more mature clover so the cows eat the new kudzu growth too close. If this new growth is kept grazed off, the kudzu will be weak and puny the remainder of the summer.

Dairymen are reporting good milk production when the cows are on kudzu. Robert Sally, Orangeburg, S. C., a soil conservation district cooperator, said, "I'd rather have kudzu on my place for milk cows than any other permanent grass or legume." The District Supervisor, Joe A. Smith, Springfield, S. C., said, "When my cows run out of grazing, I turn them on my kudzu and their milk production goes back up." There are many dairymen using just a few acres of kudzu to turn their herds on for a couple of hours a day. They find that they can maintain the production of their herds in this way when the other pastures are getting a little tough or low.

Frank S. Green, Villa Rica, Ga., a cooperator with the West Georgia Soil Conservation District, didn't have to buy any feed or sell any cattle during the drought. In fact his herd of 51 Angus cattle gained weight all summer. He says, "I was talking to a man the other day who remarked that I was mighty lucky that my cattle were not suffering from the drought like many others were. I told him, 'It's not luck—it's just the result of four or five years of planning for a grazing program and hard work to get it established to take care of emergencies like this.'"

Mr. Green's grazing program consists of 50 acres of fescue and ladino clover; 40 acres of Bermuda, Dallis grass, and white clover mixture; 15 acres of sericea; 12 acres of kudzu, and 25 acres of ryegrass and reseeding crimson clover. In addition there are 3 acres of alfalfa used for hay. He has a high regard for his 12 acres of kudzu, pointing out that it carried his herd through the drought last summer. "I'd rather have kudzu than any insur-

ance you can buy," Mr. Green said, "and it's a lot cheaper."

Kudzu is good insurance as so many cattlemen found out last year. The acres in kudzu and the number of cows you have to feed determine the drought coverage that you have. To be completely covered, it will be necessary to have more acres than will ever be needed for grazing. When the kudzu is not needed for grazing, it can be cut for hay. That is one of the big advantages of kudzu. It can be used for hay or grazing at any time of the year. It does not get tough and unpalatable like some of the other legumes and grasses. Kudzu, if not used for hay or grazing, is not wasted. The top growth falling back on the soil as mulch and the increased root growth are building future productivity of the soil.

There are many farmers in the Southeast who have abandoned a field, planted kudzu, and then gone back 5 to 10 years later and made 30 to 50 bushels of corn. The effects of the kudzu last for a good many years after the first corn crop. Rather than kill out the kudzu, there are a good many farmers who are putting corn on the kudzu only every fourth year. In this way they get two hay crops and a crop of corn every four years. The land has been built up to 60 or 70 bushels of corn per acre under this kind of management.

Hog raisers are finding that they can make more profitable pork when they have a field of kudzu to run their pigs on while they are growing.

Turkey raisers have used kudzu. If kudzu is in the wrong place, a flock of turkeys will not only clean it up but will kill it out.

One of the chief complaints against kudzu is that it will not stand continuous heavy grazing. That is entirely true. It just means that it is

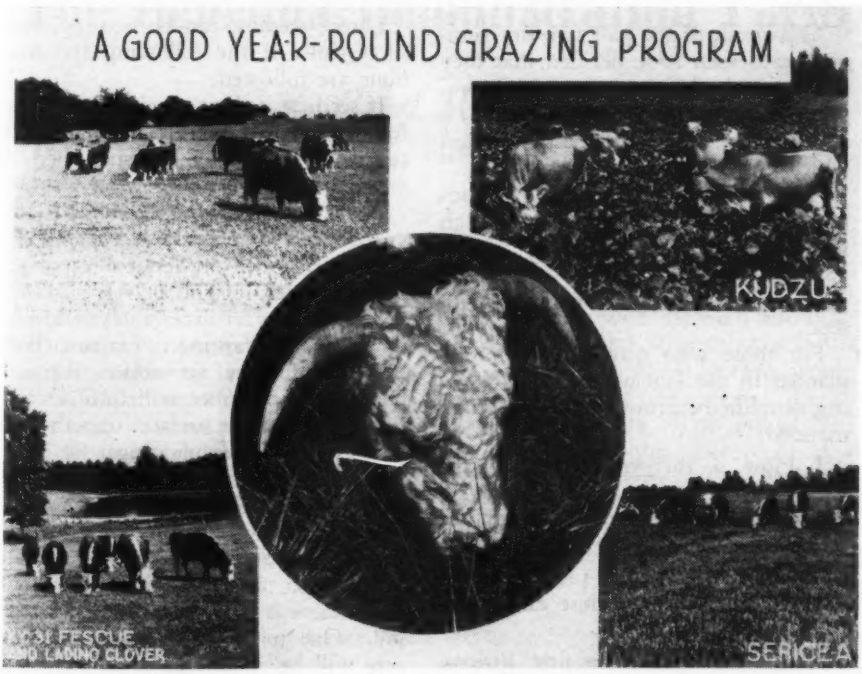

Fig. 2. Upper left: Dallis grass, Bermuda grass, lespedeza, and white clover. Lower left: Ky. 31 fescue and ladino clover. Upper right: kudzu. Lower right: sericea. Kudzu is needed during dry summers and every fall for that period when summer grasses are tough and before the cool season crops get enough growth. Soil Conservation Service photo.

necessary to plan the grazing program so that there are enough acres to take care of the number of livestock. The Georgia Coastal Plain Experiment Station has been grazing kudzu since 1933. They report, "This pasture is grazed continuously from about the middle of June to late October at the rate of one animal unit per acre. Preliminary grazing tests have shown that kudzu should not be grazed in spring before vine growth is well established. The average beef yield for the past 16 years has been 218 pounds per acre. The kudzu has not been fertilized with the exception of two 5-ton applications of stable manure."

In those sections of the Southeast where the summer seasons are shorter, kudzu will not start growth as early in the spring and will be killed by frost earlier in the fall. In those sections where dry falls are the rule rather than the exception, kudzu is used for grazing only after the first frost has stopped growth.

As a result of the past two dry summers cattlemen have decided that they need more kudzu in their grazing program. It is fortunate that there is ample acreage in most sections from which crowns can be harvested.

Kudzu, like any other crop, responds to good land preparation and high fertilization. It requires the use of good crowns or seedlings. It is also practical to make direct planting with seed.

For those who want to get kudzu planted in the late winter, the following simplified furrow method is recommended:

1. Plow a furrow slice along the slope with a turn plow set so as to throw out a deep furrow, turning the soil down hill.

2. On the return trip, plow a furrow slice up hill, but not close enough to form a high ridge.

3. Set crowns in the first furrow, pressing them into the loose soil on the lower wall so as to hold them in place.

4. Plow another furrow down slope to cover the crowns up to, or 2 to 4 inches above, the buds.

5. On the return trip, plow another furrow up slope to the first return furrow.

6. Apply fertilizer in the first covering furrow.

7. Plow a second furrow down slope to fill the first covering furrow.

8. Plow at least one more round so as to leave a plowed strip of sufficient width for convenience in cultivation.

Depth of covering the buds (Step 4 above) will, of course, depend upon the location and the time of planting. In areas where several freezes may be expected after planting, cover the buds sufficiently to protect them from freezing. *Rake the extra soil from the tops of the rows with a harrow early in the spring* so that the young shoots will come through readily. Be sure to leave the top of the row over the plants as a definite ridge so as to avoid silting in over the buds.

Direct seeding can be accomplished successfully if the following specifications are followed:

If seeding is done carefully and then followed up by clean cultivation, a complete stand may be established in one or two years.

Beds may be prepared about 6 feet apart as for any other row crop. Apply in rows and bed on about 300 pounds of a fertilizer such as 0-14-10, 0-12-12, or any similar fertilizer analysis several days before planting. Harrow beds down until they are almost flat. A board drag or roller is helpful in getting the ground surface smooth and well firmed before planting.

Plant 10 to 15 seeds per linear foot after the weather is warm, usually about late cotton-planting time for the locality. Cover seed about a half inch deep. It is advisable to plant while there is plenty of moisture in the soil. One to two pounds of seed per acre will be required.

A Planet Junior seeder may be used for planting kudzu seed. Most other

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Fig. 1. The hard-working Benedicts, Barbara and Brad.

The Benedict Demonstration Farm

By G. A. Wickstrom

Sumner, Washington

"AND they think they're going to grow grass on that place!" This was the remark overheard at a farm meeting. It was made by a farmer in Whatcom County, Washington. He had just looked at the Brad Benedict farm and had heard about the plans for converting it from a run-down dairy farm to an efficient, productive model farm. The farm he saw was indeed in bad shape. It had been farmed since 1898 and was known to local residents as the "Old Judge Hardin Place." When Judge Hardin died in 1940, the farm was rented and the soil was cash-cropped until it would produce no more.

In 1948, two young people who love dairy farming more than anything else, Barbara and Brad Benedict, bought the farm. This was their first venture in farming, and they worked hard, long hours trying to improve the place. They did fine with the herd and with the buildings and fences, but still the 54 acres of cropland pasture would not produce the feed needed for 16 cows and 9 heifers. The annual feed bill was making the place more of a feed lot than a farm. The Benedicts were being hard-pressed to look for other means of income, perhaps by working away from the farm. This, then, was the situation in January of 1952.

The world is a strange place, and strange things happen, especially in this country. In October of 1951, a group the Benedicts had never heard about, the Soil Improvement Commit-

tee of the Pacific Northwest Plant Food Association, was meeting at McCall, Idaho. This joint college-industry committee was deeply concerned about the unproductiveness of Northwest pasture and forage crops. The members analyzed the situation and decided that even though we had good pasture recommendations, only a small portion of the dairy and livestock farms were following those recommendations. It was evident that the farmers needed to be shown that improved practices would pay off in dollars and cents. How to do this? WHY, TAKE A WHOLE FARM, TREAT IT RIGHT, AND SEE WHAT THE RETURNS ARE!

The Plant Food Association agreed to furnish the fertilizer for three years for each of three projects—one in Washington, one in Oregon, and one in Idaho. As a location for the first project, to begin in 1952, the leading dairy county in the State of Washington, Whatcom County, was chosen. This selection was no accident. The natural leader for any such project would be the County Agent, and LeVern N. Freimann is recognized as one of the outstanding agricultural extension agents in the nation.

Mr. Freimann enthusiastically organized two committees—one made up of Grange and Farm Bureau members to oversee the project, and the other a technical committee to make the recommendations for the farm. The members of the technical committee came from all groups—Extension Service, Experiment Stations, S.C.S. Field Office, S.C.S. Nursery, F. H. A., Fertilizer Industry, Banks, and Farm Equipment. The cooperation exhibited within this group was amazing.

The technical committee selected the farm to be used for the demonstration on the basis of the need for the assistance this program could provide, and the Benedict farm was a natural. In February of 1952, Barb and Brad saw the first of a parade of some 1,000 people who would tramp over the farm that year. It was the technical committee out to see what had to be done. They found 24 acres of Class II peat which was producing a modest stand of mostly bluegrass. They found 30 acres of upland Lynden sandy loam, 95 feet of good cement-grade sand to

Fig. 2. F. T. Tremblay, formerly of the Western Washington Experiment Station (left), and County Agent LeVern Freimann (right), two of the instigators of the demonstration farm. They are examining the stand of red clover and Italian ryegrass.

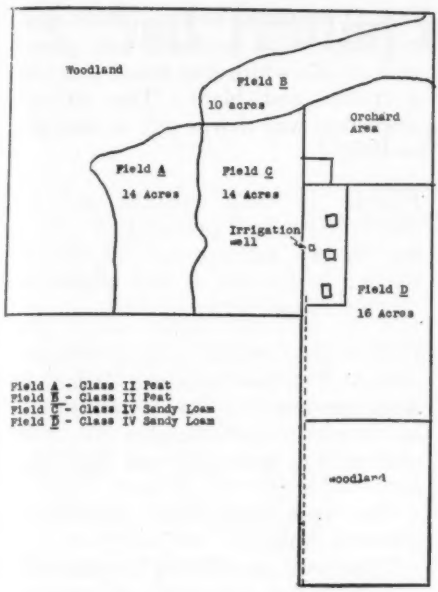

Fig. 3. The Benedict Demonstration Farm.

gravel below. This had only a thin stand of the ever-present quackgrass. Seedings in 1951 had failed. It looked as though it was going to be a tough first year for the project. The whole farm needed reseeding badly, but that would leave no pasture to carry the stock early in the season.

Local ground-water history showed that water was not too far down. The Soil Conservation Service and the Farmers Home Administration engineers immediately worked out a plan for sprinkler irrigation. They originally designed it for from 20 to 30 acres, but Brad talked them into locating it so he could reach any field on the farm—a very fortunate change that may some day allow him to save a new seeding from drying up.

The Plan

County Agent Freimann and his committees had the information they needed. They obtained the seed as a donation from the Chas. H. Lilly Company, the fertilizer from the Plant Food Association, and the irrigation system at two-thirds cost from the Farmers Equipment Company at nearby Lynden. The remainder of the cost of the system was handled on a loan from the Farmers Home Administration. However, the retail costs of all materials were entered into the farm books for record. The plan of action can be followed by referring to Figure 3.

Irrigation

Brad started digging by hand and hit water at 15 feet. The well-drilling company went another 17 feet, and Brad had plenty of water in one of the driest years on record.

FIELD *A*—14 acres of peatland pasture—all that would be available to provide feed for the herd until the new upland seedings were established.

Fertilizer: 600 lbs. of 5-10-10 per acre on April 4,
100 lbs. of ammonium sulphate per acre in June,*
50 lbs. of ammonium nitrate per acre in September.

FIELD *B*—10 acres of peatland. In rough pasture in 1951 this field was prepared for planting of a fast-growing hay or silage crop.

Fertilizer: 500 lbs. of 5-10-10 per acre,

Seeding: 125 lbs. of white oats per acre on June 13.

FIELD *C*—14 acres of upland sandy loam for a hay and silage crop.

Fertilizer: 600 lbs. of 3-10-10 per acre,
100 lbs. of ammonium sulphate per acre,*
2 tons of lime per acre on six acres.

Seeding: 12 lbs. of Italian ryegrass and 8 lbs. of red clover per acre on April 7.

* All supplemental nitrogen applications were made through the sprinkler irrigation system.

FIELD *D*—16 acres of upland sandy loam for permanent pasture.

Fertilizer: 600 lbs. of 3-10-10 per acre on May 19,
100 lbs. of ammonium sulphate per acre in July,
100 lbs. of ammonium sulphate per acre in September,
2 tons of lime per acre on 10 acres.

Seeding: 10 lbs. of S-143 orchard grass and 3 lbs. of Blue Tag ladino clover per acre on May 19.

Management: Cross-fenced with electric fence into one-acre fields for rotation grazing.

Results by Field

FIELD *A*—Pasture. In 1951 this field carried 16 cows and 9 heifers until July 15, at which time they were removed and silage feeding had to be started. In 1952, 18 cows and 11 heifers were turned on in April and pastured until August 7, when the cows were removed to the new seedings. The heifers remained until November. This field was not irrigated except to apply the nitrogen fertilizer. A portion of this field also produced 4 tons of hay and 12 tons of silage.

FIELD *B*—Oats. 65 tons of fair quality silage were produced and placed in a pit silo which was dozed out with a tractor and blade. The pit silo worked so well that it will be enlarged in 1953.

FIELD *C*—Italian ryegrass and red clover. This field provided 25 tons of hay in two cuttings and 22 tons of silage. In October it was clipped to provide 21 tons of green feed.

FIELD *D*—Orchard grass and ladino clover. This field provided 24 tons of silage on July 29. Cows were turned on August 7 until October 30. Five tons of hay were also cut from this field.

The farm production records are given in Table I.

Thus with an effective program the last six months of 1952 only, the increase in butterfat production for the whole year was 69.1 pounds per cow. Marvin Sickles, Extension Agent, who was responsible for the bookkeeping figures presented in this article, went further to show that there was an increase in butterfat per crop acre of 29.8 pounds.

With the increase of high-quality, home-grown feed Mr. Benedict was able to cut his feed purchases by $50.39 per animal unit. An animal unit con-

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TABLE I.—FARM PRODUCTION RECORDS

	1951	1952	1953 (Estimates)
Herd—Cows, average milking	14	16	25
average dry	2	2	2
Heifers	9	11	20
Calves	7	15	15
Total milk, lbs.	84,056	121,330	?
Total butterfat, lbs.	3,979.2	5,588.9	?
Butterfat per cow, lbs.	280.2	349.3	?
Hay produced, tons	26	34	60
Silage produced, tons	49	123	150
Green feed, tons	0	21	0
Cow grazing days	1,342	3,573	7,000

Soil Testing in New Jersey

By E. R. Purvis

Soils Department, New Jersey Agricultural Experiment Station,
New Brunswick, New Jersey

IT is no longer necessary for the farmer to lime and fertilize his crops solely on the basis of costly experience. Numerous soil-testing laboratories have been established throughout the world in the past quarter century. These laboratories provide farmers with some measure of the chemical control long held to be essential in the manufacture of industrial products. The methods employed in the rapid testing of soils have weathered the onslaught of critics and are rapidly being refined and calibrated to cope with the varying conditions met with in the field. Today, there are few sections of the United States where soil testing service is not available, and farmers have been quick to make use of the assistance thus offered.

How Soil Tests Can Help

Soil tests can assist farmers in several ways. They indicate the amount and kind of fertilizer and lime that should be applied to a certain crop when grown on a certain soil. Often they can be used to determine which of two or more available fields are best suited to the growth of a specific crop.

Combined with plant tissue tests, soil tests are excellent diagnostic tools for trouble shooting when a crop fails to grow satisfactorily. Figure 1 illustrates the results obtained with alfalfa in one such instance. In a mixed seeding with brome grass, on a Norton clay loam soil, alfalfa produced very poor growth during the first season. Soil samples indicated an available potassium level of only 60 pounds to the acre. Replicated plots were treated with muriate

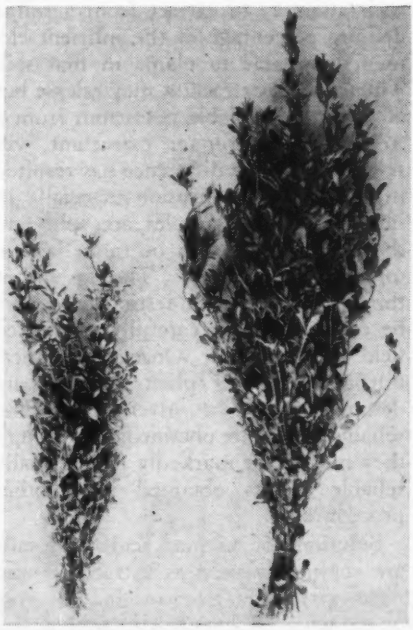

Fig. 1. Effect of potassium level in soil upon growth of alfalfa. Samples from areas of similar size in untreated and treated plots on soil testing 60 lbs. available potassium per acre. Left—from plot receiving no additional treatment; right—from plot receiving 200 lbs. per acre K_2O from muriate of potash.

of potash at the rate of 200 pounds of K_2O to the acre during the early spring of the second year. The effect upon growth of the alfalfa at time of the first cutting after application is shown in Figure 1. The two bundles of alfalfa are from similarly sized areas of untreated and treated plots. The increase in yield due to treatment was over 400%.

Soil tests also afford an excellent control method for detecting leaching losses after heavy rains. In such instances,

nutrients lost from the soil can be replaced before the crop begins to suffer from deficiencies. Potato growers in New Jersey have profited greatly from such use of soil tests in recent years.

Soil-testing Procedures

There is great variation in the procedures employed by different laboratories in testing soils. However, all systems of analysis have one thing in common—each attempts to extract from a soil a definite percentage of the nutrient elements available to plants in that soil. Thus a weak extractant may release but 50% of the available potassium from a soil while a stronger extractant will release all. This difference has resulted in considerable confusion especially in instances where samples are split and the results from two or more laboratories are compared. The important thing is that each soil-testing procedure be calibrated with carefully conducted field experiments. Once the critical nutrient levels of plant response are determined for a given procedure, reliable results are obtained even though they may differ markedly from equally reliable results obtained by another procedure.

Solutions of various acids and salts are commonly used as extractants and have given satisfactory results. Because of the wide variety of soils in New Jersey, the Soil-testing Laboratory of the Experiment Station employs electrodialysis to remove available nutrients from the soil. This method is believed to extract all available nutrients from both light and heavy soils.

A few soil samples were tested for farmers by the Soils Department of the New Jersey Agricultural Experiment Station as far back as the early 1920's. These early tests consisted primarily of a physical examination of the soil and a determination of its lime requirement. The current type of chemical testing dates from 1935, when a separate laboratory was established within the Soils Department for the sole purpose of providing a soil-testing service for farmers. This laboratory is now handling over 16,000 samples a year, and the load is steadily increasing. In addition to the Station laboratory, there are at least 10 commercial soil-testing laboratories in New Jersey. In most instances, these are connected with canning or fertilizer companies. A conservative estimate of the total number of soil samples being tested annually for farmers of New Jersey by all laboratories would be in the neighborhood of 50,000.

The Station laboratory receives samples through the County Agricultural Agents, or direct from farmers. In either case, the results of the chemical tests are sent to the County Agent concerned, and he makes the lime and fertilizer recommendations to the farmer. Instructions regarding the interpretation of tests are supplied the County Agents by the Soils Department. There is no charge to the farmer for this service.

A New Soil-test Servicing Program

In recent years there has been a growing demand from farmer groups for a more effective soil- and plant-testing service than can be offered on a "no charge" basis. Perhaps the greatest weakness of most soil-test services is the lack of properly trained personnel to interpret the results of the laboratory tests in terms of field recommendations, and to follow through with field inspections during the growth of the crop. Farmers have been quick to note this weakness and are setting out to correct it.

As the result of demand for an improved service, the Soils Department of the New Jersey Agricultural Experiment Station has undertaken two research projects to determine if such service can be rendered on a self-supporting basis. The projects are set up on a graduate assistant basis and, during the early phase of the work, considerable assistance is being given by several members of the regular staff.

The ultimate goal of these projects is the establishment of local laboratories in areas where a sufficient number of

farmers are interested in the service to make it self-supporting. Each laboratory will be manned by a technician to do the chemical testing, and will operate under a supervisor who is well trained in soil fertility and plant physiology. The supervisor will translate the results of the laboratory tests into field recommendations, will circulate among cooperating farms during the growing season, and will always be available for trouble-shooting calls. It is evident that this man would render invaluable service to a farming community and that his value would increase with experience.

Each soil-test servicing unit will operate under a system of set fees for the work it does. It is estimated that it will require from 200 to 400 farmers to support each unit and that each farmer will spend from $25 to $50 annually for the service.

To date, some 300 farmers are cooperating in the two projects, and farmers in two other areas of the State are asking for similar service units in their communities. Although it is too early to predict the ultimate success of these projects, most farmers who have used the service are continuing to do so and new members are coming in at a satisfactory rate.

Summary of Results from Tests for 1952

Tables I and II summarize the results from over 16,000 soil samples tested in New Jersey during 1952.

TABLE I.—PER CENT SAMPLES IN VARIOUS pH RANGES

pH range	Per cent of samples tested
Less than 5.0	10.1
5.0–5.4	18.3
5.5–5.9	24.0
6.0–6.4	25.4
6.5–6.9	15.3
More than 7.0	6.9

It will be noted from Table I that 28.4% of all samples tested were more

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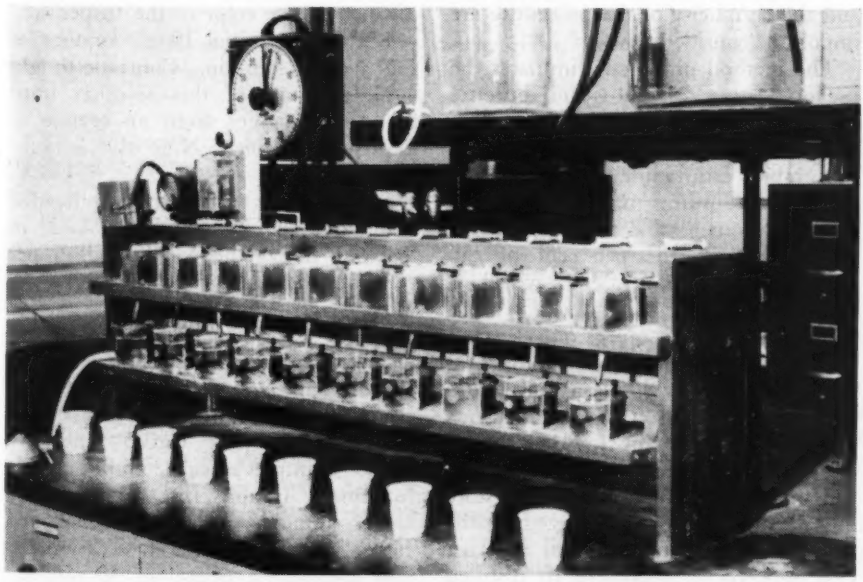

Fig. 2. Battery of 10 miniature electrodialysis cells used for extracting available nutrients from soil. Nutrients are extracted from 10 samples in 20 minutes with this apparatus.

A Rapid Test for Calcium Carbonate Equivalent in Liming Materials

By Seton N. Edson

Department of Soils, University of Florida, Gainesville, Florida

THE use of agricultural limestone has increased tremendously in recent years and all available supplies, including by-product materials, have become increasingly important. To qualify for PMA payments, ground limestones and liming materials must contain a minimum of 70 per cent calcium carbonate equivalent. Therefore, it is important to know the purity of the limestone or similar material offered for sale or available for use. The time required to make the purity test and the simplicity of the procedure are important considerations.

The method proposed eliminates the use of heating apparatus and burettes and introduces the use of resazurin indicator for improved color end-points. For rapid estimation of results, the quality of liming material tested is obtained from a table of pre-calculated values opposite the per cent of calcium carbonate equivalent arrived at by the test.

The procedure requires only a small pharmaceutical balance, a 250-ml. Erlenmeyer flask, a 40-mesh sieve, and a 25-ml. graduated cylinder. Reagents include a quantity of 1 N HCl and 1 N NaOH solution. These chemicals may be obtained at any drugstore and need not be re-standardized for the test. The indicator reagent, a 1 per cent solution of resazurin in distilled water, may be obtained from any dairy supply house.

The procedure is given as follows:

1. Weigh 2 gms. of air-dry material that has been finely crushed with a hammer and passed through the 40-mesh sieve.

2. Place the 2-gm. sample in the 250-ml. Erlenmeyer flask and add 50 ml. of 1 N HCl solution. *Allow to stand for 30 minutes, swirling the flask* INTERMITTENTLY.

3. Add 20 to 30 ml. of distilled water and 4 to 5 drops of the resazurin indicator. Swirl flask and note the distinct orange color of the suspension.

4. Add the initial 10-ml. amount of 1 N NaOH solution. Continue to add 4-ml. amounts of this solution until the color changes from an orange to a distinct purple. Note the amount of alkali used.

5. Reference to the column headed "Amounts of 1 N NaOH to Add" in Table I shows the corresponding per cent of calcium carbonate equivalent.

Experimental and Discussion

The procedure given for determining the approximate calcium carbonate equivalent of liming materials was tested against pure $CaCO_3$ and five random samples of calcic and dolomitic limestones (Table II). By using a larger amount of more concentrated HCl, shaking the flask occasionally, and allowing a period of 30 minutes for the reaction to come to completion,

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Fig. 1. Clods brought to surface by plowing this sandy field near Seminole, Texas, with a 30-inch disk. Duned areas where disks failed to bring clay to surface are still blowing.

Deep Plowing of Sandy Soils

By W. M. Nixon

Regional Agronomist, Soil Conservation Service, Fort Worth, Texas

DEEP plowing of sandy soils to control wind erosion is all right—IF and BUT.

It's all right IF it's combined with vegetative measures that put organic matter in the soil.

It's all right BUT it's not in itself a cure-all for wind erosion. If it isn't used in combination with vegetative practices, it will eventually do more harm than good.

A farmer near Altus, Oklahoma, can verify the latter. He deep-plowed a 50-acre field in 1950 and again early in 1951. He thought that would take care of his wind erosion. So he didn't include any vegetative measures. That field blew so badly in the spring of 1951 that big mounds of sand humped up along the edges of the field. A quarter of a mile of the adjacent county road was piled six to eight feet deep with the blowing sand.

Not far from that blown-out field H. L. Montgomery has a sandy-land farm. A supervisor of the Jackson County soil conservation district, he has practiced deep plowing since 1939 and has done an outstanding job in controlling wind erosion and increasing crop yields. But with his deep plowing he has carried on a careful program of cover cropping and stubble mulching.

Deep plowing in the right places has these advantages:

1. It stops soil blowing long enough

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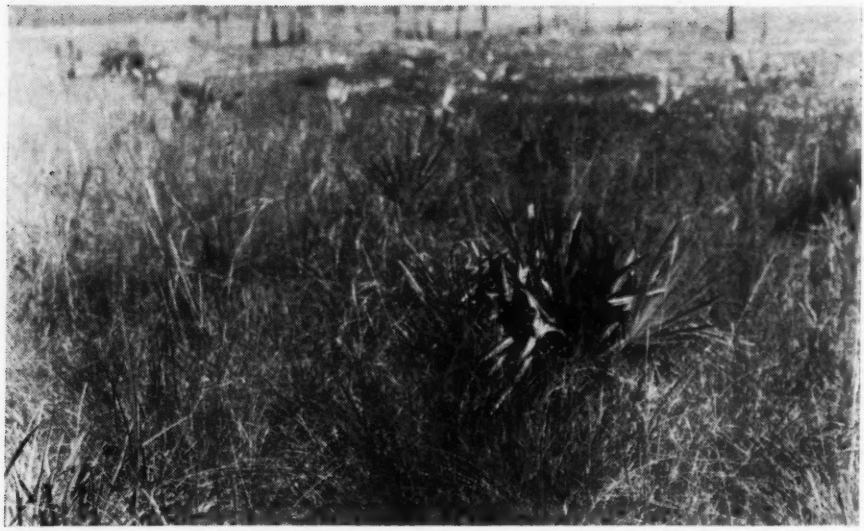

Fig. 1. Native vegetation typical of that found on many acres of cut-over, flat, pineland in peninsular Florida.

The Florida Pasture Outlook

By G. B. Killinger

Agronomist, Florida Agricultural Experiment Station, Gainesville, Florida

THE pasture outlook for Florida is bright. This statement is based on pasture development and production in the State over the last decade.

True, the pasture outlook somewhat parallels the cattle outlook which in turn is dependent upon the price of cattle and cattle products. About a year ago cattle prices were at an all-time high and today the prices have fallen considerably. This condition naturally has affected pasture development by some cattlemen. However, those with a long-range view in mind, those who intend to stay in the cattle business, are pushing rapidly ahead in the field of pasture development. During the past 10 years much of the pasture improvement has been on Leon fine sand or similar soils which originally were covered with pine trees, wiregrass, palmetto, gallberry, and other woody or fibrous vegetation species (Figs. 1 and 2).

Improved pastures from 1930 to 1950 have increased from less than a half-million acres to nearly two million acres. For this same period, purebred herds of beef cattle increased from 10 to approximately 550 in Florida and there is no reason to believe this trend will stop. In fact, there is every indication that purebred and better bred cattle will be rapidly increased for a number of years. "Florida has been the fastest growing cattle state in the nation since 1940."

It is only natural that for more and

Fig. 2. General view of same area shown in Fig. 1 after native vegetation was destroyed by disking and with a few pine trees removed. This area is being limed and fertilized prior to establishing improved pasture.

better bred cattle, pastures of higher quality are needed. The improvement and expansion of the purebred cattle industry in Florida will depend upon the increased acreage and quality of improved pasture.

If all of the one and one-half to two million acres of so-called improved pasture were to be properly fertilized and the grazing managed to best advantage, nearly twice as much beef could be produced on the same acreage.

There are another five million or more acres now in carpet grass—either

Fig. 3. Carpet grass-pine woods pasture similar to thousands of acres being grazed in Florida. Mowing or chopping to destroy weeds combined with liming and fertilizing would greatly increase beef returns from this type of pasture.

Fig. 4. Carpet grass-white clover pastures produced 619 pounds of beef per acre, four-year average, Gainesville, Florida. Lime on acid soils and annual applications of 0-12-12 or similar fertilizer are necessary for high production on grass-legume pastures.

seeded or a natural stand which if fertilized regularly would conceivably produce twice as much beef as is now being realized (Fig. 3).

These last two statements might be summed up as: Florida pastures need more fertilizer and better management and said pastures would produce considerably more beef than is now being produced if these two factors were corrected.

For example, in 1952 rather average pastures of Pensacola Bahia, Coastal Bermuda, and Pangola grass produced 343, 439, and 366 pounds of beef per acre during a seven-month period at Gainesville. These pastures were fertilized with 500 pounds per acre of an 0-12-12 fertilizer in the fall and top-seeded to winter clovers, which made only moderate growth due to a droughty soil, resulting in rather average pastures with a moderate amount of fertilization. Over a four-year period at Gainesville, carpet grass-clover pastures averaged 619 pounds of beef per acre per year on a more moist soil with the same fertilization (Fig. 4).

Taking the one and one-half to two million acres of improved pasture in Florida and with proper fertilization and management, probably 200 pounds of beef could be produced per acre per year. This means an annual production of 300,000,000 or more pounds of beef per year. The five million acres of carpet grass should conservatively produce 75 pounds of beef per acre per year under similar treatment.

This total of 675,000,000 pounds of beef per year might well be divided into 275,000,000 pounds for maintenance of cow herds and increase in cattle and the 400,000,000 pounds of beef remaining might well be marketed. Florida marketed approximately 165,000,000 pounds of beef in 1950. Thus with present pastures, two and one-half times more beef could be produced by increasing fertilization and by better pasture management.

Besides the six or seven million acres just mentioned, there are another eight million acres of native or unimproved lands being grazed and producing a sizable amount of beef of poorer quality.

Yes, it looks like Florida can expect big things in pasture development.

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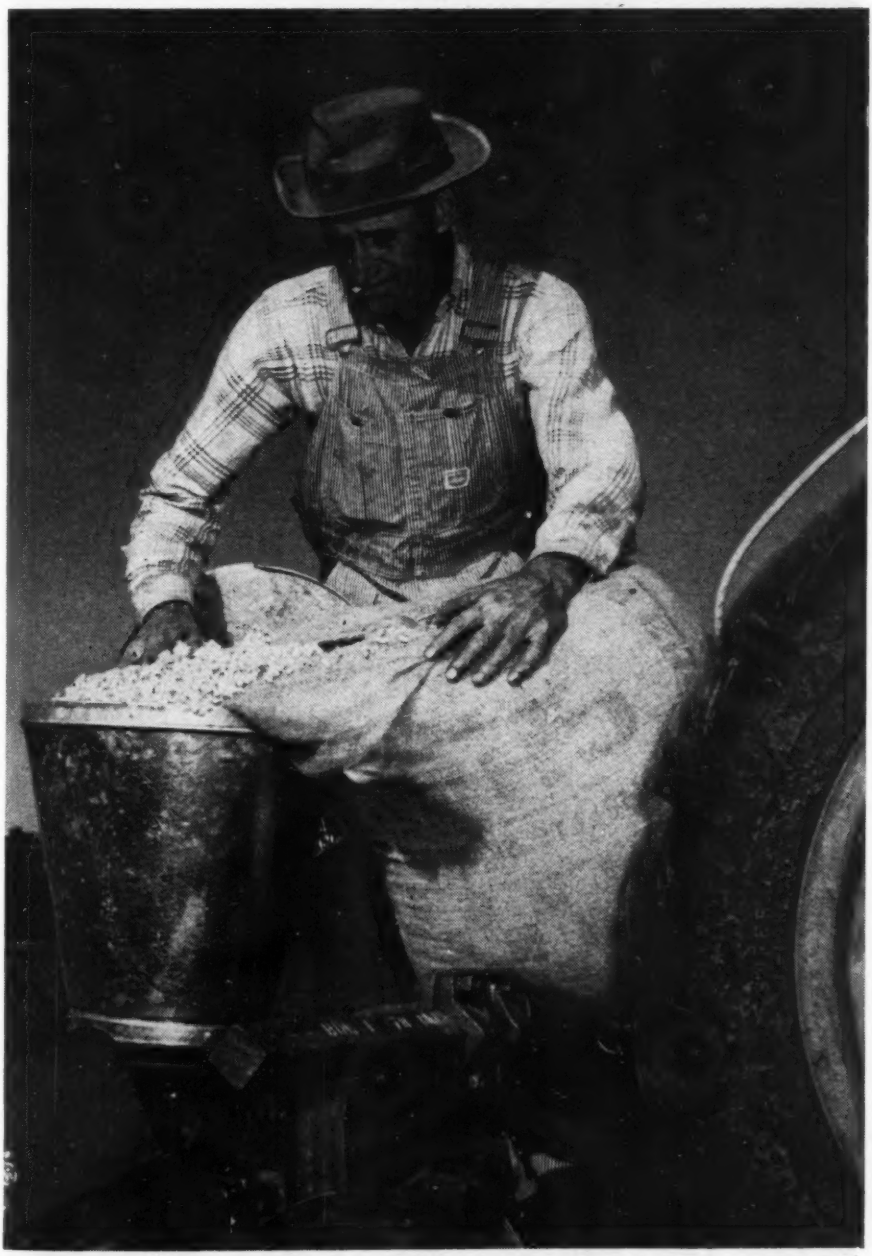
PICTORIAL



Time to Plant Cotton!

Left: Winter's last fling.

Below: Long rows for sorghum.

Above: A modern highway

Below: No speeding here.

Above: A country store of yesteryear.

Below: A typical market of today.

The Editors Talk

Our Cover Picture

You can produce 900 or more kernels of corn from each seed planted, if all the growing conditions are favorable, including sufficient available potassium. The cover page illustrates three typical symptoms of potash starvation—marginal leaf scorch, defective nodal tissues, and undeveloped, chaffy ears.

The external symptoms of corn plants affected by severe potash hunger are well established. The causes of the internal breakdown of the nodal tissues and damaged roots are not fully understood but some interesting facts have been reported.

Roots supply leaves with water and minerals. The leaves manufacture carbohydrates and albuminous compounds which are distributed to all living tissues in the plants for their growth and functioning.

The distribution of the water, minerals, and foods takes place in the vascular bundles containing the "pipes." In the stalks these fibrous bundles are held in the pith. They are the veins in the leaves and leaf sheaths. The leaves, ear-shanks, and roots are all connected and are dependent on the efficient operation of all of these pipes, and particularly those in the nodes or joints. Each node can be likened to a railroad yard. Here the pipes are intermeshed and surrounded by highly specialized tissues which control the railroad-yard operations. If anything happens to these pipe lines in the nodal tissues, the interdependent functions of the roots and leaves are disrupted. This affects the health of both the leaves and roots, and actually the ultimate fate of the plants.

The marginal leaf necrosis, or "scorch," is associated with potash deficiencies in many species of plants. It may be due to the excessive loss of water from the potash-deficient tissues or to the accumulations of toxic substances in these marginal tissues. An accumulation of amino acids sometimes occurs in potassium-starved plants. Excess amounts of all sort of various elements, some of which are relatively useless nutritionally, are often found in these marginal tissues. Current researches with radioisotopes will unquestionably explain many of these marginal tissue disorders.

Accumulations of iron, manganese, aluminum, and other metals in the nodal plate tissues are associated with the disruption of the functioning of the intermeshed tissues. In many plants starved for potash the pipe lines to the roots, as well as those leading into the ear-shanks, become badly damaged. This causes the roots to be starved for foods from the leaves; it prevents the filling of the kernels on the ears; and also results in the gorging of the leaves with foods which cannot be translocated to needy parts of the plants. Roots and leaves then become the prey of omnipresent fungi and bacteria. The roots weaken and the stalks may lodge badly. Leaf tissues are rapidly destroyed and severe damage results.

Thus, it appears that one of the roles of potassium in corn plants is to help control the functioning of the pipe lines and keep all parts of the plant in a condition of health necessary to complete the job of producing 900 or more matured kernels on the ear of the plant grown from the single seed hopefully planted in the springtime.

Soil Management

With the term "Soil Management" ever-recurring in agricultural literature and vocabularies, how many of us can quickly phrase a definition which is concise, understandable, and all-inclusive? A good one was noted in a little article appearing in the February issue of Agricultural Items published by the Federal Reserve Bank of Richmond, Virginia. "It means," the Bank says, "maintaining the productivity of the soil—its capacity to produce indefinitely under maximum but proper use."

"No two farms are alike," the article continues "thus few will respond in exactly the same manner to the same type of treatment. For this reason each farmer needs to determine for himself—though perhaps with the aid of local professional agricultural workers—what type of soil-management program he needs to develop and carry out on his own farm."

The Bank believes that almost any constructive program for improving soil should begin with soil tests. Generally, soils do not contain sufficient amounts of the various plant nutrients to produce high yields, and some also need lime. Fertilizing by guess opens the way to lower profits through failure to apply the quantity most likely to give optimum results. Most farmers who have tried have found it profitable to stop guessing what their crops need in the way of fertilizer by having their soils tested, and then fertilizing and liming according to recommended practices.

Listed in the follow-up are the capability inventory of their land, the adoption of better crop-rotation practices, contouring, strip cropping and terracing, drainage, cover crops, pastures, and woodlands.

With all of this good advice, we believe there should be another note of emphasis —Now is the time to start a good soil-management program. Too many farmers in their addiction to custom or urge for immediate profit are delaying the practices which in the long run would prove wise investment.

The Bank has observed that farmers who have sound and well-integrated soil- and farm-management programs find that as the programs become fully operative, crop yields are better; soil and fertility losses are reduced; and the organic content of the soil is frequently improved. Such programs have also provided the basis for profitable livestock enterprises. Net farm incomes have increased, and the future earning power of the farm unit safeguarded.

With surpluses again beginning to plague the agricultural outlook picture, now is the time for every farmer to consider most carefully his best long-time investment—the management of his soil.

More Capital Less Labor

In a talk before the American Society of Farm Managers and Rural Appraisers, D. B. Ibach of the Bureau of Agricultural Economics, U. S. Department of Agriculture, stated that our farm output has risen fast because we are able to employ more capital in our farming and get more production with less labor. Based on recent surveys by the BAE Division of Farm Management and Costs, he explained that data were furnished on corn production per man hour as affected by using commercial fertilizers.

From no fertilizer to the use of the most profitable rate of application, the output of man labor per hour rises from about 2.5 to 7.5 bushels. This is a rise of 200 per cent. Likewise, the labor charge per bushel falls from about 28 cents to less than 10 cents. This is a drop of about 65 per cent. So fertilizer is one of the items which has contributed much to the substitution of capital for labor on American farms, he concluded.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay [1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941.....	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942.....	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947.....	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948.....	30.4	48.2	155.0	222.0	129.0	200.0	18.45	67.20	....
1949.....	28.6	45.9	128.0	214.0	124.0	188.0	16.50	43.40	....
1950.....	40.1	51.7	91.7	173.0	153.0	200.0	16.70	86.50	....
1951.....	37.9	51.2	163.0	306.0	168.0	211.0	19.50	69.30	....
1952									
March.....	36.72	23.5	216.0	383.0	165.0	220.0	20.35	61.50	....
April.....	37.30	15.0	231.0	416.0	168.0	218.0	20.05	60.80	....
May.....	36.08	43.5	264.0	433.0	170.0	213.0	18.65	60.80	....
June.....	38.02	44.0	310.0	436.0	173.0	206.0	17.05	61.90	....
July.....	37.02	42.0	274.0	446.0	173.0	198.0	17.25	71.00	....
August.....	37.92	48.8	278.0	410.0	173.0	204.0	19.35	69.80	....
September...	39.11	51.0	222.0	335.0	171.0	209.0	20.25	69.60	....
October.....	36.77	50.9	211.0	294.0	153.0	207.0	20.85	70.70	....
November...	34.05	47.6	217.0	311.0	145.0	213.0	21.25	69.70	....
December....	31.71	49.6	199.0	362.0	150.0	212.0	21.65	68.50	....
1953									
January.....	29.79	46.2	206.0	386.0	148.0	210.0	21.65	65.30	....
February....	30.19	36.7	179.0	384.0	143.0	205.0	20.85	64.50	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	89	81	109	74	87	110
1938.....	69	196	80	79	76	64	57	97	88
1939.....	73	154	100	84	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	105	117	107	82	211	129
1942.....	153	369	168	134	143	124	91	202	163
1943.....	160	405	188	235	174	154	125	231	245
1944.....	167	420	214	216	170	160	139	234	212
1945.....	181	366	205	232	198	170	127	227	207
1946.....	263	382	178	248	212	209	141	319	182
1947.....	257	380	232	248	336	259	148	381	226
1948.....	245	482	222	253	201	226	155	298	214
1949.....	231	459	184	244	193	213	139	192	201
1950.....	323	517	132	197	238	226	141	384	185
1951.....	306	512	233	349	262	239	164	307	239
1952									
March.....	296	235	310	436	257	249	171	273	265
April.....	301	150	331	474	262	247	169	270	308
May.....	291	435	379	493	265	240	157	270	285
June.....	307	440	445	497	269	233	144	275	250
July.....	299	420	393	508	269	224	145	315	287
August.....	306	488	399	467	269	231	163	310	229
September...	315	510	319	382	266	236	171	309	182
October.....	297	509	303	335	238	234	176	314	189
November...	275	476	311	354	226	241	179	309	238
December....	256	496	286	412	234	240	182	304	256
1953									
January.....	240	462	296	440	231	238	182	290	237
February....	243	367	257	437	223	232	176	286	237

Wholesale Prices of Ammoniates

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.88	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
1950	3.00	1.95	11.01	11.70	10.21	9.36
1951	3.16	1.97	13.20	10.92	10.18	10.09
1952						
March	3.34	2.07	14.26	11.28	9.71	9.04
April	3.34	2.07	14.26	11.28	8.80	8.05
May	3.34	2.07	14.25	11.28	7.75	7.36
June	3.34	2.07	14.27	11.28	8.38	8.38
July	3.34	2.07	14.26	11.28	8.19	7.59
August	3.34	2.07	14.26	11.28	9.78	7.89
September	3.34	2.07	13.39	11.25	11.11	10.02
October	3.34	2.07	13.39	11.24	10.62	9.41
November	3.34	2.07	13.31	11.24	10.32	9.71
December	3.34	2.26	13.20	11.24	9.95	9.17
1953						
January	3.34	2.28	13.25	11.24	8.43	8.05
February	3.34	2.28	13.21	11.24	7.75	7.28
Index Numbers (1910-14 = 100)						
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
1950	112	68	315	331	303	266
1951	118	69	377	310	302	287
1952						
March	125	73	407	320	288	257
April	125	73	407	320	261	229
May	125	73	407	320	230	209
June	125	73	408	320	249	238
July	125	73	407	320	243	216
August	125	73	407	320	290	224
September	125	73	383	319	330	285
October	125	73	383	318	315	267
November	125	73	380	318	306	276
December	125	79	377	318	295	261
1953						
January	125	80	379	318	250	229
February	125	80	378	318	230	207

Wholesale Prices of Phosphates and Potash **

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[2]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[2]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
1950	.763	3.83	5.47	.371	.716	14.33	.195
1951	.813	3.98	5.47	.401	.780	15.25	.200
1952							
March	.832	3.98	5.47	.420	.827	16.00	.210
April	.840	3.98	5.47	.420	.827	16.00	.210
May	.860	3.98	5.47	.420	.827	16.00	.210
June	.860	3.98	5.47	.353	.708	13.44	.176
July	.860	3.98	5.47	.386	.768	14.72	.193
August	.860	3.98	5.47	.386	.768	14.72	.193
September	.860	3.98	5.47	.389	.768	14.72	.193
October	.860	3.98	5.47	.391	.768	14.72	.193
November	.860	3.98	5.47	.391	.768	14.72	.193
December	.860	3.98	5.47	.427	.827	16.00	.210
1953							
January	.860	3.98	5.47	.430	.827	16.00	.210
February	.860	3.98	5.47	.430	.827	16.00	.210
	Index Numbers (1910-14 = 100)						
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
1950	142	106	112	68	75	59	83
1951	152	110	112	72	82	63	83
1952							
March	155	110	112	75	87	66	85
April	157	110	112	75	87	66	85
May	160	110	112	75	87	66	85
June	160	110	112	65	74	56	80
July	160	110	112	70	81	61	82
August	160	110	112	70	81	61	82
September	160	110	112	70	81	61	82
October	160	110	112	70	81	61	82
November	160	110	112	70	81	61	82
December	160	110	112	75	87	66	85
1953							
January	160	110	112	76	87	66	85
February	160	110	112	76	87	66	85

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and all Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1927.....	141	148	139	116	89	150	100	94
1928.....	149	152	141	121	87	177	108	97
1929.....	148	150	139	114	79	146	114	97
1930.....	125	140	126	105	72	131	101	99
1931.....	87	119	107	83	62	83	90	99
1932.....	65	102	95	71	46	48	85	99
1933.....	70	104	96	70	45	71	81	95
1934.....	90	118	109	72	47	90	91	72
1935.....	109	123	117	70	45	97	92	63
1936.....	114	123	118	73	47	107	89	69
1937.....	122	130	126	81	50	129	95	75
1938.....	97	122	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	123	130	127	86	56	130	102	77
1942.....	158	149	144	93	57	161	112	77
1943.....	192	165	151	94	57	160	117	77
1944.....	196	174	152	96	57	174	120	76
1945.....	206	180	154	97	57	175	121	76
1946.....	234	197	177	107	62	240	125	75
1947.....	275	231	222	130	74	362	139	72
1948.....	285	250	241	134	89	314	143	70
1949.....	249	240	226	137	99	319	144	70
1950.....	256	246	236	132	89	314	142	72
1951.....	302	271	263	139	93	331	152	76
1952								
March....	288	275	251	144	98	336	155	78
April.....	290	276	251	142	98	322	157	78
May.....	293	276	252	142	98	306	160	78
June.....	292	273	250	141	98	316	160	69
July.....	295	273	250	141	98	313	160	73
August....	295	274	252	144	98	337	160	73
September.	288	271	250	145	98	349	160	74
October...	282	269	248	145	98	341	160	74
November.	277	268	248	144	98	336	160	74
December..	269	267	246	146	101	329	160	79
1953								
January...	267	267	246	144	102	307	160	80
February..	263	264	246	142	102	296	160	80

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] All potash salts now quoted F.O.B. mines only; manure salts since June 1941, other carriers since June 1947.

**** The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. The maximum discount is now 16%. Applied to muriate of potash, a price slightly above $.353 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Fertilizer Placement for Connecticut Tobacco," Agr. Exp. Sta., New Haven, Conn., Bul. 561, Nov. 1952, T. R. Swanback and P. J. Anderson.

"Effect of Boron on Snap Beans," Agr. Exp. Sta., Univ. of Conn., Storrs, Conn., Inf. 35, Feb. 1952, J. M. Lent and J. Scarchuk.

"Peanut Fertilizers and Amendments for Georgia," Ga. Exp. Sta., Experiment, Ga., Bul. 275, Feb. 1952, J. G. Futral.

"Fertilizer Recommendations for Georgia," Agr. Ext. Serv., Univ. of Ga. College of Agr., Athens, Ga., Cir. 371, Dec. 1952, W. O. Collins.

"Fertilizer Experiments with Corn in Central and Eastern Nebraska 1952," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Cir. 27, Dec. 1952, G. W. Lowrey and P. L. Ehlers.

"Twenty-third Annual Report of the New Mexico Feed and Fertilizer Control Office Year Ending December 31, 1952," N. Mex. Feed and Fertilizer Control Office, State College, N. Mex., R. W. Ludwick and L. T. Elliott.

"More Efficient Use of Fertilizer and Lime in Rhode Island 1953," Agr. Exp. Sta., Univ. of R. I., Kingston, R. I., D. A. Schallock.

"1953 Fertilizer Recommendations for South Carolina," Agr. Ext. Serv., Ext. Agronomy Div., Clemson, S. C., Jan. 7, 1953.

"Analyses of Commercial Fertilizers Sold During 1951-52," Agr. Exp. Sta., Tex. A. & M. College, College Sta., Tex., Bul. 755, Oct. 1952, J. F. Fudge and T. L. Ogier.

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"Some Obstacles to Soil Erosion Control in Western Iowa," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Res. Bul. 391, Oct. 1952, J. C. Frey.

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"Plan a Land Appreciation School," Agr. Ext. Serv., Univ. Farm, St. Paul 1, Minn., Form S-27, Jan. 1953, R. S. Harris and H. E. Jones.

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"Phosphorus," Agr. Ext. Serv., Miss. State College, State College, Miss., Pub. 237 (10M), June 1952, I. E. Miles.

"Studies on Soil Structure—What It Is, How Cultural Practices Affect It, How It Affects Cotton Yields," Agr. Exp. Sta., N. Mex. A. & M. College, State College, N. Mex., Tech. Bul. 363, Oct. 1951, D. S. Hubbell and G. Staten.

"The Soil Depleting Power of the Flax Crop Compared with That of Hard Red Spring Wheat, Oats and Barley," Agr. Exp. Sta., N. D. Agr. College, Fargo, N. D., Bul. 378, Aug. 1952, C. O. Clagett, T. E. Stoa, H. J. Klosterman, A. F. Kingsley, and W. W. Sisler.

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"Early Irish Potato Production Practices in Southwestern Alabama," Agr. Exp. Sta., Ala. Polytechnic Inst., Auburn, Ala., Cir. 109, Sept. 1952, M. White.

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Nutrients from Pasture Cost Less

PASTURE, hay, and silage produce nutrients at lower costs than grains do, says Frederick A. Hughes, Extension Economist at Ohio State University. He bases the statement on the amount of total digestible nutrients that an acre of each crop will produce if yields are comparable. Livestock need feed high in total digestible nutrients to produce efficiently.

One hundred pounds of TDN in corn will cost about $3.60. Other costs of 100 pounds of TDN are: from wheat, $5; from alfalfa hay, $2.15; and from good quality pasture, 75 cents.

Hughes gives comparable yields from an acre as: 80-bushel corn or 3,600 pounds of TDN; 30-bushel wheat, 1,280 pounds TDN; 4 tons alfalfa, 4,160 pounds of TDN; and 3 tons of grass and clover pasture which will produce 4,370 pounds of TDN.

Dairy animals can get 70 to 80 per cent of their ration from roughage. Beef can use a ration that is 75 to 85 per cent roughage and sheep will produce on an 80-to-90-per-cent-roughage ration.

"Farmers who make maximum use of high quality pasture and hay can decrease grain feeding from a ratio of a pound of grain to 3 pounds of milk to a 1 to 7 ratio," Hughes states.

Potash-starved Soybeans Mature Late

MANY Illinois farmers would benefit by having all fields planted to soybeans tested for potash deficiency, a University of Illinois agronomist believes. P. E. Johnson, College of Agriculture soils fertility man, has observed that soybeans grown on land deficient in potash mature slowly. These bean fields are sometimes as much as two weeks late in ripening, and the pods are not well filled and have many shriveled beans.

Johnson supervises operation of University experimental fields at Newton, Toledo, Oblong, Brownstown, and other points on the gray soils of southern Illinois. He found that often the yields were off as much as 50 per cent on potash-starved fields. On fields where a potash deficiency exists, this condition can be remedied by using moderate amounts of potash fertilizers when the soybeans are seeded.

Deep Plowing of Sandy Soils . . .

(*From page* 23)

to get vegetation on the land.

2. It brings quick increases in per-acre crop yields.

The less attractive aspects of deep plowing are:

1. The cost ($5 to $10 an acre, depending on depth.) After deep plowing, it's still necessary to grow cover and soil-improving crops, to mulch crop residues into the surface, and to use other vegetative practices if the deep plowing is to bring lasting benefits.

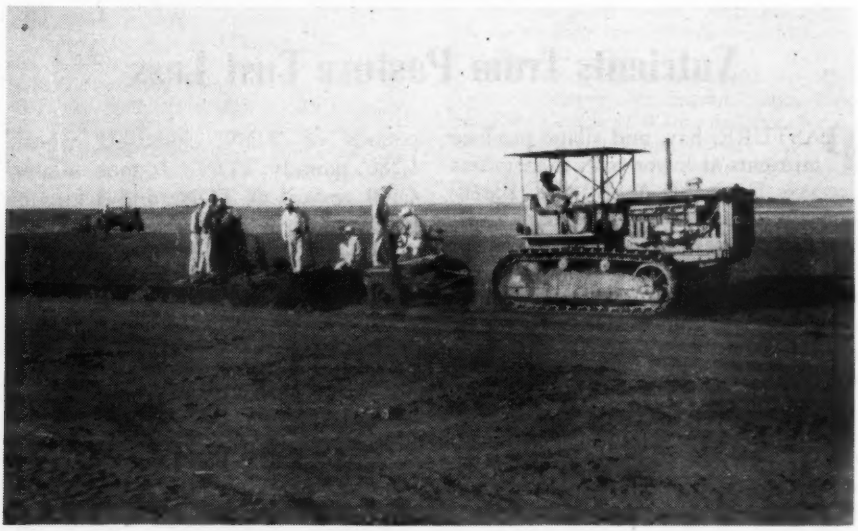

Fig. 2. Plowing a field near Morton, Texas, 18 to 22 inches deep with a five-disk plow. Farmers riding plow are observing operation.

2. Its temporary nature in controlling wind erosion and increasing crop yields unless accompanied by vegetative practices.

3. The danger of believing that deep plowing in itself will take care of wind erosion and soil improvement.

A large percentage of the sandy land in the southern part of the Cochran-Yoakum-Terry soil conservation district in the Texas South Plains is being deep-plowed. Owned by private contractors, the deep-plowing equipment is biting 18 to 26 inches deep to bring clay to the surface. On the average, five deep-plowing machines are kept busy in the area all the time.

More than 45,000 acres of sandy land have been deep-plowed in the Lynn County, Hockley County, Lubbock County, and Crosby County districts of Texas. Bulk of the plowing has been 18 to 25 inches deep. More than 50 deep-plowing machines are working in the four-county blow area. About half are owned by contractors, half by farmers.

Homer A. Taff, Area Conservationist at Lubbock, Texas, reports: "Although bringing temporary control of wind erosion, deep plowing has also caused runoff and increased the tendency to water erosion. Most deep-plowed land has been in a cloddy condition and as result seedbeds have been in poor condition for crop planting. Because of this condition and limited rainfall in some sections, crops have been slower in getting started."

Farmers in the Jackson County, Big Pastures and West Tillman, Kiowa, Farm Security, Comanche County, and Greer County districts in southwest Oklahoma are not so certain about the virtues of deep plowing as they were a year or two ago. Deep plowing in this area increased from 16,000 acres in 1949 to 26,000 in 1950 but dropped to 12,000 in 1951. The farmers found that it did not cure all their erosion problems. Nevertheless, the practice is finding favor with some of the leading conservation farmers who have been able to plow deep enough to bring clay

Fig. 3. Weeping lovegrass growing in the deep-plowed field shown in Fig. 2. The grass was planted two years after field was deep-plowed and three months before this picture was taken. The grass is nearly ready for seed harvest. It made twice the growth of lovegrass planted in an adjoining field that was not deep-plowed.

to the surface and are using legumes and other cover crops to increase and maintain organic matter in the soil. The deep plowing is being done by contractors having large machines, including crawler-type tractors.

Ralph H. Gieck, Area Conservationist at Altus, Oklahoma, reports: "Some increased surface runoff has occurred where deep plowing has been practiced. Lacking organic matter, the clay on top of the sand crusts after a rain and does not allow water to penetrate rapidly as it did before deep plowing."

During mid-year 1951 about 25,000 acres had been deep-plowed around Lamesa in the Dawson County district and 32,000 acres around Seminole in the Gaines County district of the Texas South Plains. Plow depth runs from 12 to 30 inches. Twenty-four deep-plowing rigs are in operation in the two areas. Contractors own 16 of them, individual farmers six, and groups of farmers two.

In north-central Texas around Seymour some farmers have been using deep plowing to control wind erosion and increase crop yields. But Fred P. Mika, Technician formerly at Seymour, says: "They are finding that deep plowing the second time has not been so effective and now the farmers are turning to cover crops and residues to prevent blowing. It won't be many years before deep plowing as a single practice will have lost its popularity in this area."

Deep plowing usually increases crop yields immediately because nitrogen and other plant foods that have leached down through the sandy topsoil after years of continuous row cropping are brought to the surface within reach again of the plants. Deep plowing also breaks compacted layers that restrict the downward movement of water and root growth. When the hard, watertight plow pan or other compacted layer has been broken, a better plant-soil-water relationship results.

In the southern part of the Cochran-Yoakum-Terry district, deep plowing has increased crop yields 20 to 40 per cent, farmers report. Some farmers in the Lamesa and Seminole areas report yield increases of 100 per cent.

Yield increases, however, won't hold up unless vegetative practices are used with deep plowing. Without these practices, you can be sure that within a few years yields will drop lower than they were. Meanwhile erosion danger has been increased rather than reduced.

The Experiment Station at Brownfield, Texas, reports that if deep plowing is to be effective, not less than one third of the earth brought to the surface must be sandy clay subsoil. To be successful, deep plowing must put 10 to 20 per cent of sandy clay on the surface.

Know the Answers

Before a farmer does any deep plowing, it will pay him to know the answers to these questions:

1. What kind of topsoil does he have? If it has less than 10 per cent of clay, it will blow and deep plowing can help. If it has 10 per cent or more of clay, wind erosion can be controlled by cheaper and more lasting methods.

2. How deep is the sandy topsoil? If it is more than 16 inches, deep plowing is not usually considered economical.

3. What's under the topsoil? If the topsoil is shallow and caliche or rock is below, deep plowing would be wasteful.

In the final analysis, if we weighed all the advantages and disadvantages of both methods of controlling wind erosion and maintaining and improving soil productivity, we'd probably decide in favor of vegetation over deep plowing. But since deep plowing is at the moment a popular practice, we can get the most out of it by knowing when, where, and how to dig down for the clay subsoil. Even then, of course, the operation will have no lasting value unless accompanied by such soil conservation practices as cover and soil-improving crops and stubble mulching.

Kudzu Keeps Growing . . .

(*From page* 14)

seeders cover the seed too deeply.

Where desirable, seed may be planted in hills like melons.

Clean cultivation for weed control will be needed. Hand cultivation will be required for a few weeks until plants are large enough for normal cultivation.

A side application of about 100 pounds of nitrate of soda per acre after plants are large enough to be cultivated like cotton will stimulate rapid growth.

Where plants are needed for other acreage, they may be lifted with hand shovels during the first winter. A strong seedling plant every 5 to 10 feet in the row will produce a complete stand the second year.

Soil and Life Evolve Together

"SOIL is that thin film between the earth and sky that supports all living things," says Dr. Charles E. Kellogg of the U. S. Department of Agriculture. "Beneath lie the sterile rocks, above it are the air and sunshine. From it all plants and animals, and man himself, draw their nourishment, either directly or indirectly from other things that live in soil. To it their dead bodies return. There is no life without soil, and no soil without life; they have evolved together.

"Even though we call this an industrial age, far more than half of the people in the world live by tilling the soil. They produce food, fiber, and many other things for themselves and for the rest of us. Some work efficiently and live well; others barely exist. A few try to cultivate soils that are unsuitable for use by any known methods. Many more could produce abundantly on their soil if they only knew what to do and had the means and skill to follow proper practices.

"Enough soil exists for all to have abundance. But we shall have neither peace nor abundance until we learn more about the thousands of different kinds of soils, precisely where they are, and how to use them for good production."

Soil Testing in New Jersey . . .

(*From page* 21)

acid than pH 5.4. Since only 20% of the soils in this group were potato soils, this leaves over 3,000 soil samples from fields that were badly in need of lime.

At the other end of the scale, 22.2% of the samples tested had a pH in excess of 6.5. Most of these soils are overlimed, and there is a good chance that most crops will suffer from manganese deficiency at this pH under New Jersey conditions.

Table II presents the variation in nutrient levels of the soils tested in 1952. As indicated, 4.4% of the soils tested were low in magnesium, 39.8% were low in phosphorus, and 17.7% were

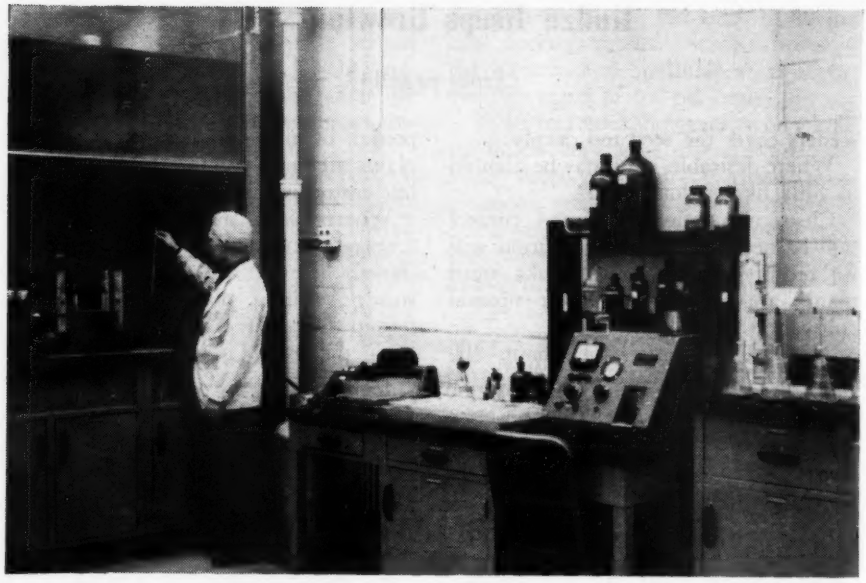

Fig. 3. A corner of soil-testing laboratory showing apparatus for determining organic matter, phosphorus, and potassium.

low in potassium. In 1949 these figures were 14.9, 36.2, and 23.5, respectively. This is a striking decrease in the number of soils having low available magnesium contents, and soil testing is chiefly responsible for this improvement. Although less marked, a similar trend is shown for potassium. The slight increase in the percentage of soils testing low in phosphorus in 1952 as compared to 1949 is probably not significant.

TABLE II.—PER CENT SAMPLES OF VARIOUS NUTRIENT LEVELS

Nutrient	Available content in soil		
	High	Medium	Low
	per cent	*per cent*	*per cent*
Magnesium...	46.1	49.5	4.4
Phosphorus...	38.4	21.8	39.8
Potassium.....	23.0	59.3	17.7

The above results show a wide variation in the lime and fertilizer requirements of New Jersey soils. Soil tests offer the only means of detecting these differences before a crop is planted.

A Rapid Test . . .

(*From page* 22)

the results obtained were comparable to those obtained by the usual heating method (1, 2, and 3)[1] in approximate analysis. It is important to shake the contents of the flask occasionally and to consume the full 30-minute period of digestion to insure complete decomposition of the carbonates. Resazurin gives a highly colored satisfactory end-

[1] Numbers refer to literature cited.

point. This indicator has an end-point value between that of methyl red and methyl orange, which is well within the active range for strong mineral acids.

TABLE I

Additions of 1 N NaOH to add			Calcium carbonate equivalent*	
Increment	ml.	Total (ml.)	%	Quality
1	10	10	100	
2	4	14	90 to 100	Excellent
3	4	18	80 to 90	Excellent
4	4	22	70 to 80	Good
5	4	26	60 to 70	Fair
6	4	30	50 to 60	Poor
7	4	34	40 to 50	Poor
8	4	38	30 to 40	Poor
9	4	42	20 to 30	Poor
10	4	46	10 to 20	Poor

* % $CaCO_3$ equivalent = $100 \times \frac{(\text{ml. of in acid}) - (\text{ml. of in base}) ((0.05))}{\text{Weight of Sample} \quad (1)}$

The poorest grade of dolomite (Sample 3) was difficult to decompose. Results obtained by the rapid approximate method compared favorably with those obtained by the heating to about 95C.

In the humid eastern United States, where the basis of good farming is the judicious use of liming materials, a simple purity test such as given above for liming materials should find several useful applications.

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TABLE II.—RESULTS OBTAINED BY THE RAPID METHOD COMPARED WITH THE CONVENTIONAL METHOD OF HEATING AND TITRATING

Sample No.	Material	$CaCO_3$ Equivalent		Quality
		Heating	Rapid Method	
		%	%	
1	Pure $CaCO_3$	100	100	Excellent
2	Dolomite	65	60– 70	Fair
3	Dolomite	14	10– 20	Very Poor
4	Dolomite	100	90–100	Excellent
5	Dolomite	87	80– 90	Good
6	Limestone	100	100	Excellent

The Florida Pasture Outlook . . .

(*From page* 26)

Average fertilization of pastures will cost between 10 and 15 dollars per acre per year and should increase pounds of beef by 100 to 150 or more per acre. Are 150 pounds of beef worth 10 to 15 dollars?

With new and more productive grasses and legumes being fitted to Florida's pasture program, particularly plants better able to utilize fertilizer

materials, cattle production will be further increased. Such grasses as Pangola, Pensacola Bahia, Coastal Bermuda, Carib, Para, St. Augustine and legumes such as white clover, ladino, kenland red, crimson, black medic, hubam, floranna and hairy indigo, when planted on suitable soils and properly fertilized and managed, will greatly assist in the advance of the Florida grazing program. It may even be possible in a few years to see fields of alfalfa growing throughout the State.

To date, much of the hay fed in Florida (some 12 million dollars worth annually), mostly alfalfa, prairie, and timothy, is shipped in from Midwest. During the past two years several thousand tons of hay have been produced and fed in Florida. This trend toward producing more hay in Florida will quite likely continue.

With over 6,000 species of grasses and a large number of legumes in the world, we in Florida and other Southern states make use of only a few. Isn't it likely that from a screening of this great volume of plants a new and better grass and legume will be found to fit Florida's climatic conditions? Possibly, a grass or legume or both that will furnish green grazing during the late fall and winter months can be found. The Florida Agricultural Experiment Station is continually and hopefully checking new plant introductions through the nursery at Gainesville and at outlying stations. In addition to the plant species already in existence throughout the world Florida's plant breeders are working with many of the pasture plants already used in the State in the hope of creating new and superior strains.

With increased fertilization, better management, and new crops it is only natural to have new diseases and insects and increases in old diseases and insects. The entomologists and pathologists, however, are keeping abreast of this condition with many new insecticides and fungicides.

It must still be kept in mind that to prepare, lime, fertilize, and plant improved pastures on stump, pine, or hammock land in Florida costs from $40 to $200 per acre and cattle prices and production must remain favorable to absorb this initial cost.

Development Will Continue

There is every indication that pasture development in Florida will continue at a quarter to half million acres annually for the next few years. There are still some 8 to 10 million acres in Florida that can profitably be utilized as improved pastures under present conditions.

Considering all practices being carried out to date by Florida cattlemen, nitrogen is the one fertilizer element that has been used too sparingly in the past. Considerable lime, phosphate, and potash are being used, which if properly backed up with nitrogen, would greatly increase pasture growth. There is not too much lime, phosphate, and potash being used; in fact, more would be profitable. However, many cattlemen fail to get full benefits from their pastures because of a nitrogen shortage. With other fertilization properly taken care of, nitrogen might well be applied to grass pastures in early spring, summer, and fall.

The Benedict Demonstration Farm . . .

(*From page* 18)

sists of one cow or two heifers or four calves. A total of $2,034 was spent for hay and silage in 1951; only $470 in 1952 and that was inherited from the year 1951.

The costs of the initial investment

Fig. 4. Brad put this sign in his pasture on Farmers' Field Day.

for the improved practices were as follows:

Fertilizer	$1,104.05
Seed	341.43
Custom work (Seedbed prep.)	42.00
Lime	223.60
Irrigation well	553.28
Irrigation equipment	2,335.35
Total	$4,599.71

Since the irrigation well is considered a permanent improvement and does not depreciate, it is not included in the annual costs. In figuring the annual per-acre costs, Table II, the costs of the lime, seed, and irrigation equipment have to be amortized over the period of years of expected life of each.

Any pasture program has to more than pay its way. At the start of this article mention was made of the possibility of 1952 being a tough year on the Benedict farm. The net dollars and cents return per acre on a comparative basis, 1952 over 1951, were as follows:

Increase in gross income per crop acre	$51.95
Increase in expenses per crop acre	40.93
Net increase per crop acre	$11.02

The increase of $11.02 per acre is not in itself a startling figure. No figures can tell the story of a farm that would not have survived the 1952 season without the improved practices that were put into effect. The Benedict farm starts the 1953 season with

TABLE II.—ANNUAL COSTS PER ACRE

Field	Seedbed prep.	Seed	Lime	Fertilizer	Irrigation	Total
A				$23.60		$23.60
B		$4.40		15.50		19.90
C	$.75	2.80	$1.50	20.56	$10.20	35.81
D	.33	3.42	2.18	24.08	11.20	41.21

Fig. 5. The silage pit dozed out with a tractor and blade. There was only about one inch of spoilage around the sides, top, and bottom. Brad plans to enlarge this silo for the increased silage expected in 1953.

an abundance of feed in the barn and silo and with excellent prospects for high-quality pasture, hay, and silage crops. The farm that could not support one-half a cow per acre in 1951 will be pasturing two cows per acre in 1953.

The fertilizer plans for 1953 include 600 pounds of 10-10-10 fertilizer per acre, plus summer topdressings of two or three sacks of ammonium nitrate per acre, on all established pastures. Hay fields will receive 500 pounds of 5-10-10 fertilizer per acre plus a top-

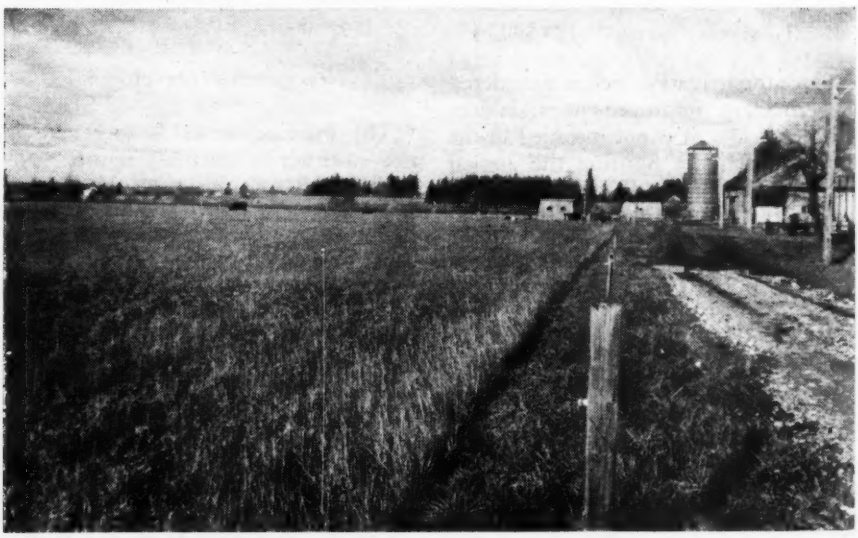

Fig. 6. Benedict's—the farm that has an outlook for the future.

dressing of 100 pounds of ammonium nitrate. There is no doubt that the increased amounts of fertilizer coupled with other good management practices will pay off in greater milk production.

The Benedicts worked harder in 1952 than ever before—as much at getting the increased growth of forages into the barn and silo as in making up for time lost talking to the many people who came to see the farm. Because of the latter, the County Agent is requesting that all groups wishing to visit the farm plan to do so on one of the following field days:

May 16, 1:00 to 3:00 P.M., July 18, September 19.

Any groups not able to meet this schedule are requested to contact the County Agent's office to arrange for visits.

What do Barb and Brad think about all this? They realize now they have been given their start by the very agencies that have existed for a long time to show how it can be done. The money spent for hay and feed not grown on the place could have launched them on this same program without the assistance of donating agencies. Perhaps this program will give farmers a little more faith in their research and extension workers.

For Barb and Brad the important thing is that the farm is no longer known as the "Old Judge Hardin Place." It's the Benedict Farm now.

Balanced Nutrition Improves . . .

(*From page* 10)

Responses from single nutrients may be disappointing where there are multiple deficiencies.

Lime Alone Not Enough

Limestone alone (O vs. L) gave only a 7-bushel increase, but lime in addition to NPK produced 19.9 bushels. Limestone is the first or "key" treatment.

Phosphorus Needed Early

Phosphate alone (O vs. P) produced 5 bushels more wheat, but phosphate added to limestone, nitrogen, and potash (LN-K vs. LNPK) gave 20.7 more bushels. Available phosphorus, to be most effective on wheat, should be present in relatively large amounts at time of germination. Results at Brownstown are a typical illustration of the effects of phosphates (40 lbs. P_2O_5) drilled with wheat at seeding time.

Potash Needs Grow

The maximum average increase from potash (LNP vs. LNPK) was about 10 bushels, but potash alone (K) or nitrogen and potash (NK) on unlimed soil gave slight decreases. Potash needs usually increase gradually a few rotations after limestone-phosphate treatments are started.

Nitrogen Needs Help

Before nitrogen can be used effectively on these gray silt loam soils, adequate amounts of limestone, phosphates, and potash must be present. The average maximum increase from 40 lbs. nitrogen on wheat (L-PK vs. LNPK) was 10.2 bushels, but nitrogen alone gave a slight decrease.

Farm trials, over a period of several years, have averaged about 7 bushels increase from 30 to 40 pounds of actual nitrogen applied.

Soil Physical Conditions

While washing soil from wheat roots there were fine opportunities to observe differences in soil physical conditions between plots. Unlimed plots which had not grown clovers invariably had a plastic soil layer just below the plowed layer. This compacted zone

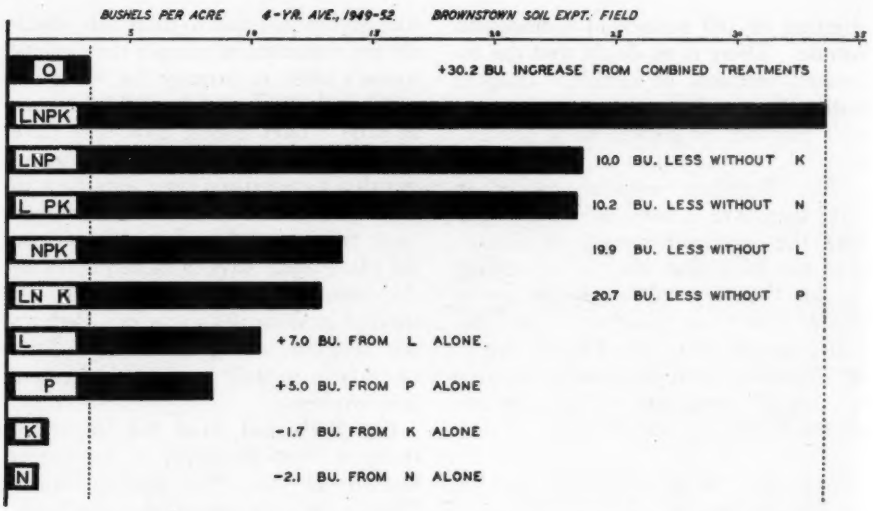

Fig. 6. Wheat yield increased about 10 times by combined treatments. Losses occurred when either limestone (L), nitrogen (N), phosphorus (P), or potassium (K) was omitted. Single treatments less effective.

was not easily dispersed by a light spray of water. Roots do not penetrate this layer readily, and neither does drainage water. Such plots are often waterlogged. The soil washed away more easily from samples taken from plots which had grown vigorous, deep-rooted legumes following the combined use of limestone, phosphates, and potash. Apparently the soil tilth had been improved below the plowed layer also.

TABLE I.—AVERAGE WHEAT YIELDS OF SIXTEEN KEY PLOTS FROM BROWNSTOWN SOIL EXPERIMENT FIELD, BROWNSTOWN, ILLINOIS.

Treatment [1]	4-yr. Av. yields	1952 yields
None	3.4 bu.	0 bu.
LNPK	33.6	25.4
LNP	23.6	19.3
L PK	23.4	18.8
L P	18.2	11.5
NPK	13.7	4.6
LN K	12.9	11.4
L K	12.3	7.3
L	10.4	3.8
LN	8.4	2.6
P	8.4	1.5
NP	7.0	4.0
PK	5.0	.4
K	1.7	.5
N	1.3	.8
N K	1.1	.9

[1] Treatments:
L—limed, 4 tons 1940, 2 tons 1948
N—40 lbs. N on wheat, 80 lbs. N on corn
P—40 lbs. P_2O_5 drilled with wheat and 40 lbs. P_2O_5 broadcast on clover stubble
K—50 lbs. K_2O per acre per year average broadcast ahead of wheat, clover, and corn.

Soil Tests Are Guides

Soil conditions vary from farm to farm and field to field. There are many soil types and dozens of man-made variations within each soil type. Soil tests enable a grower to estimate present fertility needs regardless of past variable practices. Soil tests correlated with fertility response data are used widely in Illinois to guide soil treatment recommendations.

Summary

Balanced nutrition is essential for maximum growth and survival of winter wheat roots. During 1951-52, winter injuries of wheat were increased by deficiencies of either limestone, phosphates, or potash. Any one nutrient deficiency can upset the whole farming program.

Waiting . . .

(*From page* 5)

certain shyness and awkwardness about undertaking steady work for wages. Then, too, this hour meant breaking all old associations and leaving all old customary routine behind. You were a student no longer in an academic sense. You were a man with responsibilities, a recruit in the army of the employed. So you went up to your room that evening and laid away all the algebras and grammars, the high-school annuals and programs, the mementos of boyhood and the dog-eared report cards. You stood there on a new threshold, made attractive, however, because you could begin to turn some earnings into the family treasury to balance off the debit marks against an eighteen-year-old man.

Having made good as home-town boys often do, the next memorable waiting spell is spent up in that spare room of your bride's home after getting all decked out fit to kill for the wedding. You wait there in a stiff collar and new black suit for the signal strains of the nuptial march, played by a cousin on the Steinway grand in the parlor. You feel sorry for the boys in the trenches who have fever and ague, because you think that is what ails you, too. You hear the rustle of silk gowns, the rattle of china, the murmur of talk by the assembled guests, and the solemn ticking of the clock as its hands approach the fatal hour. You wonder if you and the Missus can escape the rice and old shoes; and yet you'd feel let down hard if there were none. You have your hand on the door knob ready to open the portal to a new life, your best man slaps you on the back, the dirge begins, and the time to receive your highest degree is at hand.

In the days before every traveling man and field worker had his own shiny automobile, the reliable old railway carted us to and fro over rusty rails and bumpy roadbeds. You fellows of the field forces knew the conductors and brakemen by their first names, yelled out the windows at farmers and tradesmen and depot masters along the familiar routes, and whiled away the time reading the famous old Jackson jokebooks about slow trains and queer travelers. Every man's night bag or valise had its thick red-covered railroad guide, a companion piece of an evening with the Gideon Bible in dingy hotel rooms. But the granddaddy of all waiting spells came when you had to change cars at Bitterwater Junction. If you came in late it wasn't so tough, but when you were on time the regular schedules said that the other upcountry accommodation train would be due four hours later. The old familiar waiting-room with its hard benches divided by iron arms so you couldn't snooze in comfort was an irksome prison. In winter the room was often chilly and in summer it was stuffy. The gaudy posters about Saranac Lake and Niagara Falls were an insult to a job-bound family man, and the sound of the telegraph key and the baggage man's crashes were irritating. Such waits as these were totally tiresome and are not among the old times we treasure most.

The wait of all waits awaits the Father pacing the hospital halls listening for the first wail of a newborn child. Probably you got there with the Missus a long time before the doctor and hours prior to the blessed event. After she was removed to some mysterious inner sanctum beyond your ken, you tried to rock in one of those famous hospital waiting-room chairs with the undersides of the rockers worn flat. You knew by the looks of things that this baby would be huge and a long time arriving. You try to doze or read a professional journal with alarming pictures and examples of abnormal ob-

stetrical adversities. Maybe after a full night of nodding and nervous exhaustion they tell you to go home and rest and they'll call you in time. In time for what? So it goes until the moment of happy reunion with a baby as an extra bond.

All of us are alike subject to the painful, lingering period when we wait for our turn at the dental chair. Some of us take it harder than others. A few guys have such hard, impervious teeth that all the neglect and misuse in the world never seems to harm them. Others are beset with molar misery all their lives and help keep the dentist in luxury. Most of us put it off too long and that's why we wear false fangs. You sit there in the little waiting-room and thumb over the battered magazines a year or so old, and try not to hear the clink of devilish instruments, the buzz of a motor pile-driver of some kind, the rasp of a file, the creak of a wrench, and the muffled gag of the stupefied victim within the dental den. But let us be honest and agree that even the crack of the tooth's root as it leaves your skull socket forever is a darn sight better than waiting all night with a toothache. And the modern sand-blasting technique used by smart dentists to clean out cavities is well worth waiting for compared with the horrid grinding of a drill.

HOW about that waiting interval before you and the Missus finally own a home of your own? You share the happiness of planning, but she is the real location boss. Every room is charted on paper, it's on your mind constantly, the fever gets in your blood, the architect gets in your hair, the prospect is appealing, and the cost is appalling. You can't wait for the moving man to come so you tote out various items and objects even before the plaster is dry and the mortgage is filed. Your anxiety to shut the door of the tiny flat and emerge as a suburban householder obscures a lot of vexing questions you've left to the contractor and home-loaner for solution. No other waiting spell matches this, except the placid confidence one has while waiting for the lawn grass and garden seeds, the decorative shrubbery, and the other long-sought adornments that make a livable home.

Waiting to ask the boss at the day's end about a raise to help meet the mortgage is also a memorable event in the lives of a majority of our salaried workers. If he's an automatic grade-raise fellow there's not much sense in urging quicker action, because that's pretty well set forth in the contract. But when you deal with one of those sharp-nosed, self-made managers who prefers to keep his crew steamed up in hot water about the chances for promotion, this waiting spree is apt to have a sick hangover. With him it's rugged individualism and long hours, with uncertain world conditions limiting his keen desire to share profits with the payrollers. Thus being obliged to "stand on the carpet" and plead for advancement ranks among the most disagreeable chores for which to wait.

Most benumbing and disheartening of all dolorous waiting spells is that when you sit with your children while your wife is undergoing a very serious major operation upstairs in the surgical loft where the skylights and the klieg lights glare. You came down early that morning in summer in time to clasp hands with your helpmeet as she lay in quiet resignation, slightly dulled with drugs, on the wheel-bed they use for the critical journey. You kiss her lightly and the orderly pushes the white burden into the elevator and closes the door. Then you go downstairs and sit on a davenport with the kids, looking at the pattern of the oriental rug, talking idly to them about school affairs, sometimes trying to get interested in the war news found in the crumpled daily. You had asked them how long it might take, and they were noncommital. Each time a nurse goes by you want to stop her and inquire—but

think better of it and just wish and wait. The hours drag by. It began at about 9 o'clock and now it's noon. Tired of waiting in uncertainty, you tell the kids to get their lunch while you go up to the ward where she is located. In about half an hour the white burden returns, the quiet form rests on the high bed, the oxygen tanks are in use, the word comes that she suffered shock but that the chances are good—so be cheerful. But these nightmare pools of despondency are easily forgotten when the patient recovers and you resume the old life with appreciation for the marvels of the day and age in which we live.

WE also wait for the seasons to come and go. I am not sure who eagerly waits for winter aside from the fuel dealer and the chap who runs a resort in the tropics, unless it may be the dealer in skis or sleds or winter underclothes. I know naught of their pangs and pleasures because all my hopeful waiting these March days is for the advent of spring and summer.

The days are long in which to do. I enjoy both the rain and the shimmering sunshine. The push of upward-growing things makes summer a season of fulfillment and activity. My old friends afield are busily renewing their perpetual contract with the world of consumers. The future is bright for a bountiful harvest, with minor exceptions. This is a time when the best things that men plan for come to life and give us strength to pass another winter unafraid.

Of all the waitings and the yearnings that us countryfied people know, that which ushers in the vernal season is the most welcome and the most satisfying. It's something we can rely upon with certainty and enjoy in common. Waiting for the summer and the harvest is like a preface to a fine book or an overture to a successful drama, without despair, without remorse, and without regret.

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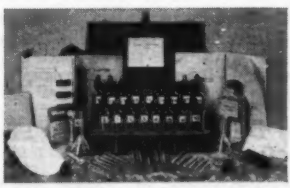

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An old prospector was reminiscing for his down East visitors: "There I was, the grizzly bear down in the canyon behind a tree. The only way I could hit him was to ricochet a bullet off the high canyon wall on my right."

Describing the setting with an up-and-down motion of his arm, he added, "A one-rail shot, you understand."

After a pause to let the drama of his situation sink in, he continued, "Well, I had gauged my windage, calculated the lead of the barrel and the rate of twist, the hardness of the bullet and the angle of yaw it would have after being smacked out of shape against the canyon wall, and I judged my chances were 60-40 that I would get the bear. A one-rail bank shot. A controlled ricochet. So I fired."

There was a silence. Then one of his visitors asked softly: "Did you hit him?"

"Nope," answered the old man, "I missed the wall."

* * *

With all those feminine falsies, a guy never knows what he's up against.

* * *

A double-breasted suit does for some men what a maternity dress does for some women.

* * *

Before the cage of a kangaroo stood a young lady, stunned. Near the cage was a sign which read, "Native of Australia." Disheartened, she turned away and cried, "To think that George threw me over for one of those things."

"What's a professor, Daddy?"

"A professor, my dear, is a man who tells his students how to solve the problems of life which he avoids by being a professor."

* * *

The farmer's young bride from the city was having a great deal of trouble making oxtail soup. Every time the water got hot, the ox would take his tail out of the pot.

* * *

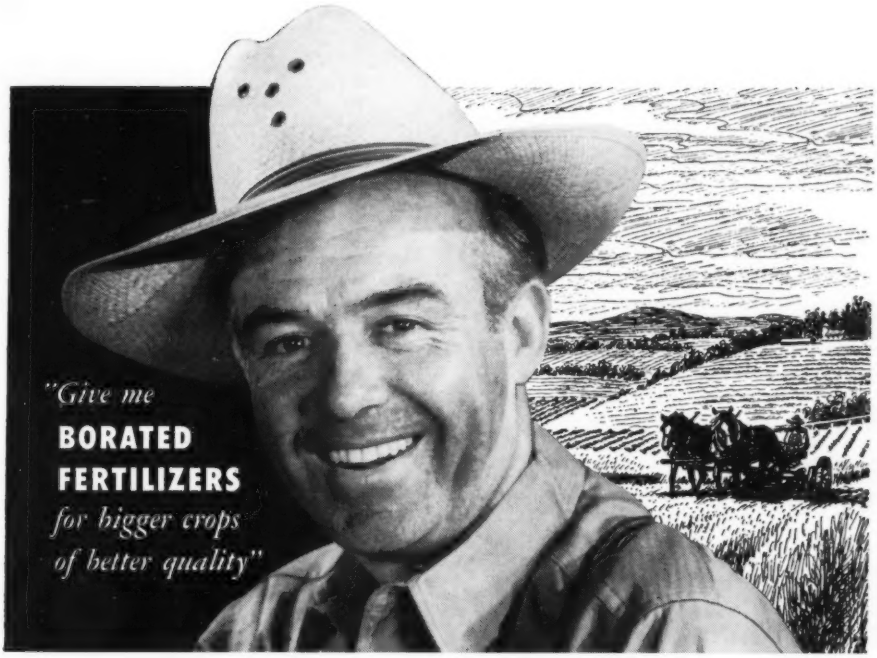
Two golfers were annoyed by a slow couple in front of them. At one hole there was a particularly long wait. One of the offending couple dawdled on the fairway, while his companion searched industriously in the rough.

At length the waiting couple on the tee could contain their patience no longer. "Why don't you help your friend to find his ball?" one shouted indignantly.

"Oh, he's got his ball," the man replied blandly, "he's looking for his club."

* * *

A pretty but plump young woman stepped on the druggist's scale, and was shocked at the weight registered. Promptly she slipped off her coat, and tried again. The results were still unflattering, so she took off her shoes. But then she discovered she was out of pennies. Without a moment's hesitation a youth stepped forward. "Don't stop now," he volunteered. "I've got a handful of pennies and they are all yours."



BORAX restores lost boron to soil

Yes, Borax does restore lost Boron to soils... the Boron that is so essential to fine, healthy crops and big yields. Although the amount of Boron required is extremely small, its importance is comparable to Nitrogen, Potash and the other essential plant foods. Don't let a Boron deficiency in soil cause crops to dwindle and plants to grow puny. Use Fertilizer Borates, the low-cost fertilizer grade of Borax, to restore the boron—then watch the yields of alfalfa, pasture crops, and many vegetable, field and fruit crops as well, increase and improve in quality!

FERTILIZER BORATE (*equivalent to approximately 93% Borax*) and FERTILIZER BORATE-HIGH GRADE (*equivalent to approximately 121% Borax*) come in fine mesh for addition to mixed fertilizer, or coarse mesh for direct application where required. This material saves you important money in cost of transportation, storage and handling, etc., because water content is held to approximately 24% water (5 mols). County Agents or State Experimental Stations should be consulted for detailed recommendations. Write today for literature!

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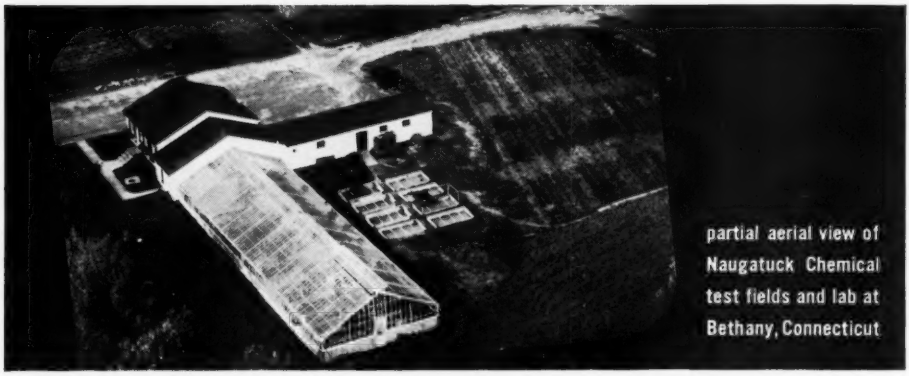

partial aerial view of Naugatuck Chemical test fields and lab at Bethany, Connecticut

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Here's where Naugatuck chemicals begin — where Spergon®, Phygon® and Aramite* first showed signs of becoming the nationally famous products they are today.

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Yes, and here's where sales are sown! When the benefits of the Naugatuck chemicals developed here eventually reach the grower, they also reach the supplier and distributor in the form of new sales and new profits.

*U. S. Pat. No. 2,529,494

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